

Put Interactive Music on Your Web Page!

SEPT/OCT 1997

Music & Computers

THE MAGAZINE FOR DESKTOP MUSIC

Duke Nukem!
Doom! Quake!

Behind the Scenes
with Composer

**Bobby
Prince**

How to Buy
**Studio
Speakers**

Reviewed:
Axon
**Guitar-to-
Computer
Interface**

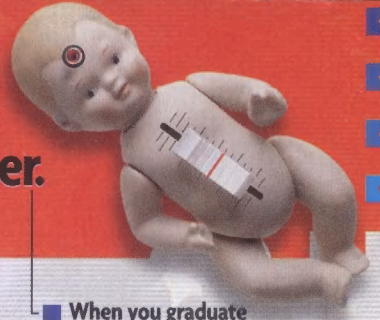
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■ **60mm faders** (MS1402-VLZ). True logarithmic design gives you smooth sound taper throughout the fader's travel.

■ **Constant loudness pan controls** let you precisely set the position of a channel in a stereo mix (both models).

	MS1202	MS1402
Mic preamps	4	6
Mono inputs	4	6
Stereo inputs	4	4
Total mono inputs	8	10
Aux sends	2	2
Stereo aux returns	2	2
Ch. inserts	4	6
Equalization	3-band	3-band
Ch. controls	rotary	faders
Ctrl Rm matrix	yes	yes
Solo	PFL	AFL/PFL
Metering	12-LED	12-LED
Stereo outputs	both XLR & 1/4"	
Tape ins/outs	RCA	RCA
Alt 3-4 bus	yes	yes

■ **Large, built-in power supplies** (instead of fragile, outlet-eating "wall warts" or "line lumps") provide generous current for our extra-high-output headphone amp and Very Low Impedance (VLZ®) circuitry. A Mackie exclusive, VLZ significantly reduces thermal noise and crosstalk at critical points in both mixers.

■ **Widest input level range** of any compact mixers. -10dB "virtual" pad tames hot digital inputs; up to 60dB of total gain for boosting faint sounds.

■ **Balanced inputs and outputs** (except channel inserts, phones & tape ins/outs) reduce noise and allow extra-long cable runs. Can also handle unbalanced loads.

■ **Solid steel chassis** instead of fragile plastic (both models).

■ **When you graduate from a hobbyist mixer to a compact pro version, you'll discover a vast array of brands and models. But only the MicroSeries 1402-VLZ and 1202-VLZ are the overwhelming choice of serious professionals. Ours are the small mixers found in more network sports and news departments, on- and off-line video suites, and in-house A/V departments than any other brand. Yet they're surprisingly affordable. Don't toy around with your audio. Call us today for full info including a very impressive list of enthusiastic owners.**

■ **ALT 3-4:** An extra stereo bus disguised as a mute button. Handy for submixes, separate broadcast feeds, mix minuses or extra monitor mixes.

■ **Balanced XLR outputs.** Switchable mic/line level for optimum output to audio gear, VCRs, nonlinear editing systems and A/V equipment.

■ **RCA jacks** for tape decks, CD players, or other line-level audio sources.

■ **MS1402-VLZ: The only mixer** to ever win New Media Magazine's coveted Hyper Award.

■ **Sealed rotary controls.**

■ **Channel inserts** on mic/line channels for treating voices with compressors, limiters, de-essers, etc. (both MS1402-VLZ & MS1202-VLZ).

■ **MS1202-VLZ: Winner** of Videography Magazine's 1995 Product of the Year Award.

■ **Control Room/Phones source matrix** (both models) provides tape monitor, headphone mixes, separate broadcast mixes, extra main stereo output and much more. Master section includes stereo and Aux masters, two aux return level controls, and high-output headphone jack with level control.

■ **Low cut filter** on mono channels (both models) cuts mic thumps, traffic rumble, P-pops, and wind noise. Yet unlike the "filters" on many mixers, its sharp, 18dB/oct. circuitry won't compromise audible bass.

Below: A few of the 400+ folks who work at Mackie Designs in Woodinville, WA, 20 miles north of Seattle.

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READER SERVICE NO. 101





6 INPUT

Readers recommend digital audio recording shareware, search for sequencer tips, and explore genetic composition.

14 CUTTING EDGE

Check out a CD you can re-record up to 1,000 times, a \$250 digital audio interface, and a Web-based source of audio samples.

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The musical force behind some of the world's top computer games shares his secrets and explains how to break into the business.

35 COMPUTERS COME ALIVE!

Learn how six musicians and a five-year-old computer collaborated in an innovative live performance.

47 ADD INTERACTIVE MUSIC TO YOUR WEB SITE

Download the free Microsoft Interactive Music software and follow this straightforward tutorial. Presto — instant evolving music!

REVIEWS & TIPS

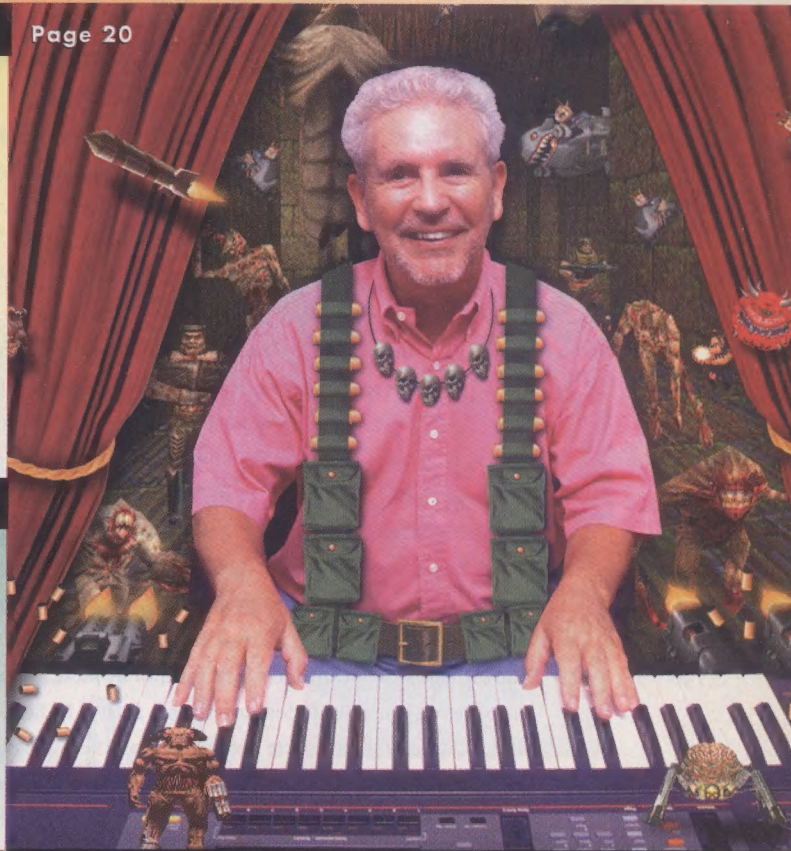
55 REVIEW: AXON NGC 60 GUITAR-TO-MIDI INTERFACE

This box converts your guitar playing into data your computer can understand. Craig Anderton rates it against the competition.

59 HOW TO BUY & SET UP STUDIO SPEAKERS

An acoustic engineer walks you through the important process of setting up a quality monitoring system.

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Back to basics: Here's how to connect a keyboard to a computer and put together your own MIDI system.

71 DOWNLOADING ZONE *by John Poultney*

Relive the haunting sounds of vintage sci-fi with these software Theremins, then stomp on two shareware effects pedals.

73 MOD PHILES *by Eric Bell*

Renowned trackers Necros, Basehead, and Skaven present their tunes, and a new plug-in lets you hear MOD files on the Web.

75 HOW DO I . . . *by Scott Garrigus*

Follow along online as Scott demonstrates how MIDI and digital audio can be used together.

80 RIDE THE WIRED SURF *by the Fat Man*

The Fat Man gets heavy: How computers (which don't have a soul) can help you find the music that's in yours.



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From the Editor



An enraged Seattle man was arrested recently for firing five bullets into his computer. What is it about PCs that arouses such passion?

It's hard to imagine someone blowing away a toaster oven, but I bet a lot of us have come pretty close to assaulting these beige boxes that can take us so far but also shut us down so cruelly. Perhaps that frustration explains the enormous popularity of gruesome combat games like *Quake* and *Duke Nukem*.

Or perhaps Bobby Prince's soundtracks are what makes these games so effective. Turn down the sound, and you'd just have a bunch of jumping pixels. (That's an interesting experiment to try with a lot of audiovisual productions, by the way. It's amazing how music amplifies the emotions suggested in a scene.)

Being more into creating art on computers than shooting at it, I confess that I didn't know who Bobby was when I met him at a computer music conference last year. In a delicious irony on the transcendence of music, even the people who knew his work were surprised to meet him, since his gracious personality bears no resemblance to the gothic, head-banging scores he creates. Over and over I heard, "You're Bobby Prince?" It was like the scene in *The Wizard of Oz* in which the man behind the terrifying fireball is revealed to be a friendly tinkerer.

Bobby's love for gadgetry comes through in our cover story (see page 20), but the cool thing is that he focuses on his music-making rather than his gear. In a theme we're fond of at M&C, he shares lots of tips on maximizing a minimal desktop music setup. In fact, Bobby was adamant about not having the article become one of those "wealthy-rock-star-sprawls-on-a-mountain-of-hopelessly-unaffordable-equipment" stories in which the reader is left feeling awed and inadequate.

One of the three secrets of getting into writing music for games, Bobby tells us, is to know your equipment. According to him, you don't need much more than a computer and a soundcard to have very successful results.

Speaking of soundcards, Creative Labs, the inventors of the Sound Blaster, asked M&C to help judge their **MIDI composition contest**. We had a lot of fun listening to your entries in the Mixman Remix Contest earlier this year (excerpts from the winning songs are posted at www.music-and-computers.com), so we were glad to help out.

The Creative Inspire MIDI Contest, named after Creative's new music-oriented Internet software, runs through October 21, 1997. Among the nearly two dozen prizes are an E-mu E4K MIDI sampler, an E-mu Darwin hard disk recorder, and stacks of Sound Blaster AWE64 Gold soundcards. To enter, stop by www.creativeinspire.com. M&C will feature the winners in an upcoming issue. Until then, may all your violence be virtual.

—David Battino

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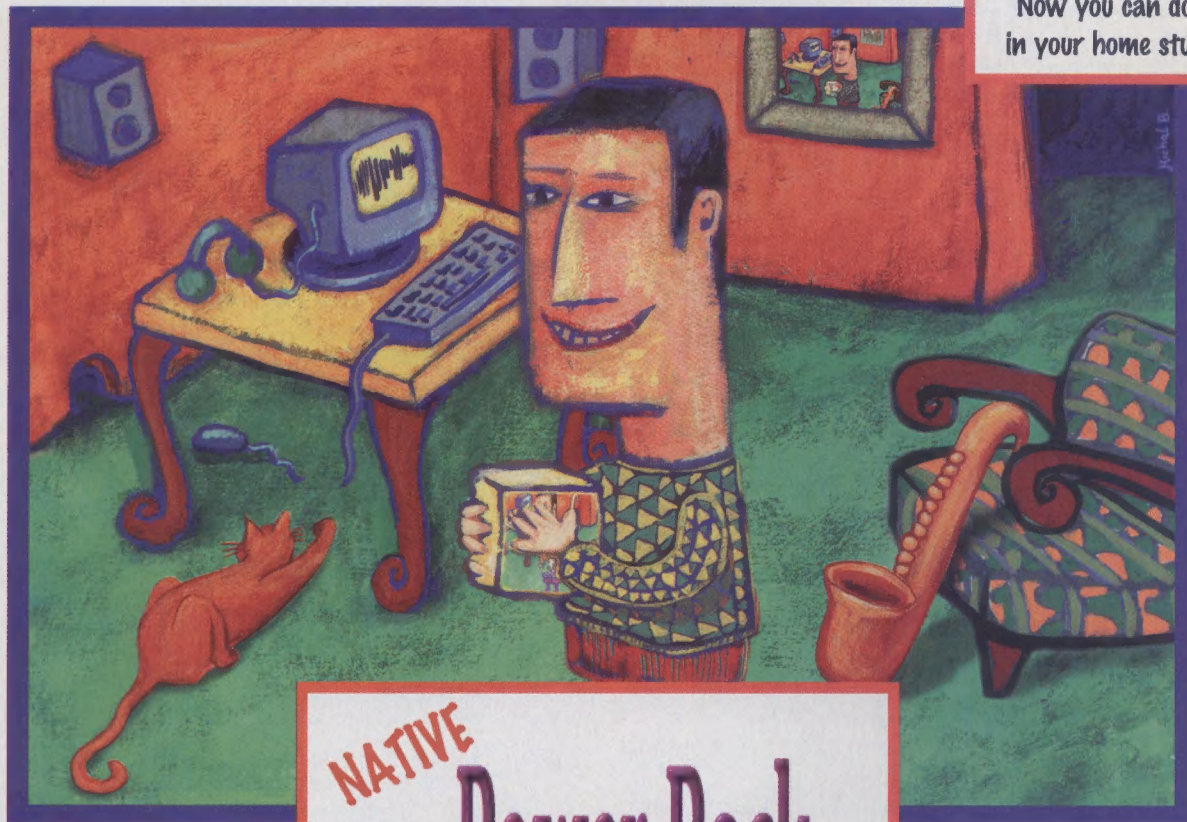
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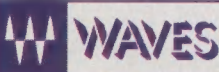
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W W W . W a v e s . c o m

READER SERVICE NO. 102

There's lots of hype these days about PCI digital audio recording systems. Companies spend a ton of money on advertising, claiming future support by a myriad of different software companies. What are we supposed to do? We need instant solutions! Our projects are due now not "soon".

Emagic, known for its integrated professional MIDI, Digital audio and Scoring software has created a cross-platform, PCI busmaster digital audio recording card with 8 discrete outputs for less than \$800: Audiowerk8. Since the product's launch last Spring, thousands of users worldwide have attested to the incredible ease of installation and use and the warmest analog to digital conversion in the business. The Audiowerk8 works on both Windows and MacOS computers just like Logic Audio, the sequencing software it was designed to work with from the start.

Version 3.0 of this award winning music production tool now offers a rich complement of real-time DSP effects such as Equalizers, Filters, Reverbs, Chorus, Flangers and Delays with up to 8 inserts and sends per track, depending on your CPU.

The combination of Logic Audio 3.0 and Audiowerk8, allows the completion of professional production jobs on a very tight budget.

There's a whole slew of new features such as: punch in on the fly, cycle recording, contiguous synchronization of audio to MTC and much more. You can even use 2 Audiowerk8 cards and get a total of 24 physical audio tracks and 16 outputs.

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READER SERVICE NO. 103

McWindows

I read a letter in the May/June '97 issue with much interest — the one about a perceived M&C editorial focus on Macs. It made me think again about computers, music, and the complex state of the “Mac vs. Windows” debate.

We have just released two Windows 95 multimedia guitar CD-ROMs. [Ed. Note: M&C reviewed one of them, Play Guitar with Ross Bolton, in our May/June '97 issue.] The PR process with our new discs has been interesting. Nearly all magazines are Mac-based, which is understandable, given the history of desktop publishing. Most music mags are Mac-based, which is understandable, considering the long history of the Mac as a digital audio/MIDI/music workstation as well. Music magazines want to receive Mac versions of CD-ROMs because the editor/reviewer can demo them at the office or at home.

Of course, Windows outsells the Mac by a wide margin, and most developers are doing Windows for sure, and Mac maybe. We're keeping an eye on the Mac, but we don't know if we can justify the cost of a port, given the news out of Cupertino in recent years. We don't dislike the Mac; we use Macs for nearly all of our video and audio production. We're intrigued that Apple has bought Next because we started out as NextStep developers. When we think of Apple moving to a new OS, however, we're being cautious. Microsoft has at

least provided a stepwise path for moving from 16-bit to 32-bit (Windows 3.1 to 95 to NT). NT is shipping, and growing in installed base. Apple's Rhapsody has not been released yet. Will the apps be there when Rhapsody ships? Will a large enough installed base be there when our products are ported?

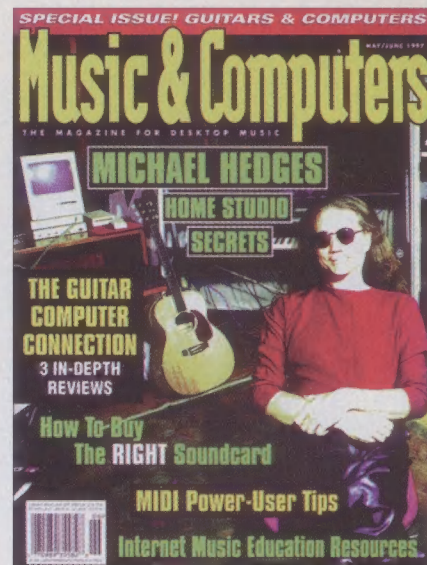
Scott Szymkowski
President, Play Music
scott@playmusic.com

I have purchased two of your issues from the newsstand and must say that you have almost targeted me. It's a great magazine, and I was almost about to get a subscription. The reason I didn't was because the magazine seemed more Mac/Apple-centric. I know you're fighting a fierce battle to keep your presentation balanced between PCs, Macs, and workstations, but I thought I would write to let you know where you lost me. The best example I can give is your four-part article on creating your own CD [“From Desktop to Disc,” Sept/Oct '96 through Mar/Apr '97]. Since I was in the process of doing this myself, I bought the first two issues. After reading a lot of info concerning the author's Mac problems and issues, I tuned out.

I'll keep looking for your mag to browse through at the newsstand and buy when you run something I need.

Tony
via Internet

Greetings from Costa Rica. “From Desktop to Disc” was fabulous; I can't wait to hear the CD. I'm a Mac user and I can definitely attest that since I've been receiving your magazine, both platforms have been given equal air time. Of course, I'd prefer to see only Mac articles, but I'm no snob. The keynote here is creativity, and your articles exude



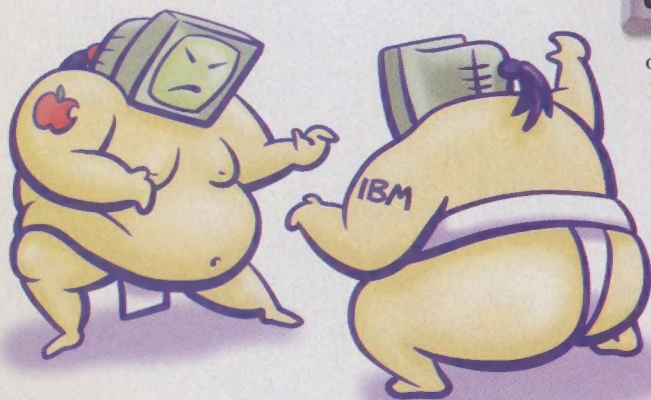
playfulness and so very little sarcasm. So whether it's Mac, PC, or any other platform, it all just translates into music. Let's make it with what we got, in the name of fun.

Lenny Iacono
via Internet

Lim Pickin's

You guys should really review N-Track. It's by far the best and cheapest software I've ever used. It's very simple, just like a 4-track recorder. For example, I'm an industrial musician, and I use Impulse Tracker (Jeffrey Lim's shareware MOD recorder) to write my music. It has an option to write the MOD file to disk as a .WAV file, but it only writes in mono (unless you pay an extra \$30 to Lim for a stereo writer). So before I recorded to disk, I silenced all of the left channels and only recorded the right. After that, I silenced the right channels and recorded only the left.

When they were done, they were saved under two different names (song1.wav and song2.wav). I took N-Track and inserted song1.wav as the first track and song2.wav as the second, and then fixed the balance so that song1.wav was on the right channel and song2.wav on the left. Then I could render the song into one stereo .WAV (the rendering option is available upon registering — for a measly \$18), or I could add vocals, guitar, etc. The number of tracks is only limited by your processor.



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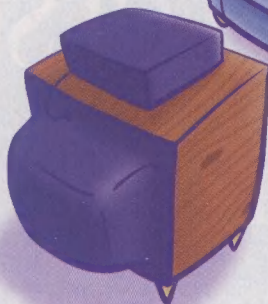
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You can find N-Track on the Shareware Music Machine, www.hitsquad.com/smm/.

Shawn "Carrion" Hines
via Internet

Shawn — Not to make you feel guilty, but this month's MOD Philes column (page 73) reports that Jeffrey Lim has ceased updating Impulse Tracker because so few users paid the shareware fee.



The Price Is Lite

As many readers have said before, your magazine is absolutely fabulous! I never miss an issue. I'm looking for an instructional video for Cubasis Audio (beginner's version). I saw one in a store about a year ago and it was about \$60. Would you know of any place where I could acquire one for a little less?

Jim O'Grady
ogrady@globalserve.net

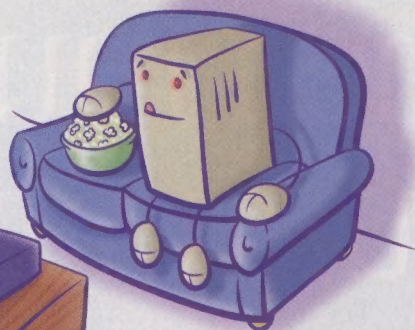
Jim — We contacted Steinberg, who said they offer a CD-ROM-based video tutorial for \$30. It's for Cubase (not Cubasis), but many of the concepts are the same. Steinberg also recommended the free 24-hour tech support service on their Web site, www.steinberg.net.

A quick Net search turned up the Ubik Music site (www.ubikmusic.com/cubase.html), where you can buy a Cubase video tutorial for \$12.95. This two-hour tape was co-produced by Steinberg US. Ubik's site also features Cubase tips.

Another good place to get tips is the alt.steinberg.cubase.newsgroup. We found it by searching on "Cubasis Audio" in the newsgroup locator www.dejanews.com.

Explicit Lyrics

Im in the intermediate stages of building a home page using HTML and I was wondering if you could give me a few suggestions about adding some background music. What I'd like to do is simply extract some music from some of my CDs and save it on my Mac as some kind of .WAV file, but the



built-
in Mac

utilities I have only allow me to record between ten and 35 seconds worth of sound. Is there a program out there that fits my wants? And if possible, is there a program that can eliminate lyrics to reduce file size?

Thomas Ng
via Internet

Thomas — Those utilities are probably recording to RAM instead of to your hard disk, which is why the recording time is so limited — one minute of CD-quality stereo digital audio requires about 10MB to store. Programs like BIAS Peak (reviewed in our July/Aug '97 issue) and Macromedia SoundEdit 16 can record directly to disk and save audio files in compressed formats (RealAudio and Shockwave, respectively) that are well-suited for Internet audio delivery. (Note that eliminating vocals from a digital audio file won't reduce its size. Removing vocals — which you could only do in a gross way via destructive filtering — would just alter the sound of the file, in the same way that turning down the bass knob on your stereo could "eliminate" a kick drum.)

For more background on realtime Internet audio formats (there are many options), see our Jan/Feb '97 cover story. Our sister magazine Keyboard also did an extensive feature on Web music in its July '97 issue.

Before you start uploading audio, though, note that it's illegal to distribute music extracted from copyrighted CDs. If you're not set up to record original tunes, you might take a look at CDs



of clip tunes, which typically cost more, but grant you the license to use the music in other contexts.

Another option is algorithmic composition programs like PG Music's Band-in-a-Box (also reviewed in the July/Aug '97 issue), which can generate license-free MIDI-based music. Our Mar/Apr '97 cover story discussed some of the exciting ways that MIDI is being used to put music on the Web.

Music & Pork-Belly Futures

I have just been introduced to the marvels of MIDI and your magazine, and wish to explore it further in my own way. During my career as a stockbroker, I used artificial intelligence (including neural nets, fuzzy logic, and genetic algorithms) to analyze financial data. If I can convert MIDI data files to a matrix (rows and columns) of numbers, work on them using AI, and then reconvert to MIDI, I believe I can "create" new music, e.g., using genetic algorithms to evolve and mutate a song after specifying my "fitness" function. Then I can play them back through Band-in-a-Box and my synth.

Am I correct? If so, can you tell me whether I can convert/reconvert MIDI data into rows and columns of numbers (or zeros and ones). If so, what software is needed, and where can I get it?

I hope to stimulate discussion on this topic, or meet people who have done something of this sort.

Ng Tian Khean
Republic of Singapore
khean@singnet.com.sg


Ng — If you were to reduce MIDI messages to ones and zeros (bits) and rearrange them, it's extremely unlikely you'd end up with data that could produce sound. But a MIDI-processing program like Opcode Max (which we covered in our Sept/Oct '96 issue) would be ideal for this type of composition. In fact, Gary Lee Nelson, who wrote the Max article, has developed

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Includes 133 MHz Pentium® processor-based computer, and Kawai X50-D synthesizer

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- High-end Kawai X50-D General MIDI synthesizer with touch-sensitive keyboard, digital effects with reverb and chorus built-in, one finger ad-lib, mixing, and more
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Hands-on course includes a Pentium® 133 computer plus a Kawai X50-D professional-level synthesizer, Cakewalk MIDI sequencing software, Sound Blaster-compatible sound card, Netscape Navigator™ Web browser, bonus Internet training and more!

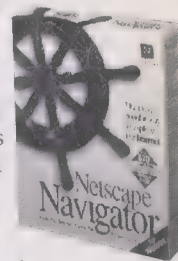
- SoundSculptor software that visually demonstrates the operation of FM music synthesis
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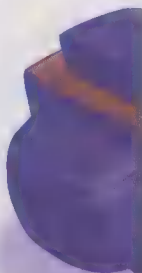
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You can find N-Track on the Shareware Music Machine, www.hitsquad.com/smm/.

Shawn "Carrion" Hines
via Internet

Shawn — Not to make you feel guilty, but this month's MOD Philes column (page 73) reports that Jeffrey Lim has ceased updating Impulse Tracker because so few users paid the shareware fee.



The Price Is Lite

As many readers have said before, your magazine is absolutely fabulous! I never miss an issue. I'm looking for an instructional video for Cubasis Audio (beginner's version). I saw one in a store about a year ago and it was about \$60. Would you know of any place where I could acquire one for a little less?

Jim O'Grady
ogrady@globalserve.net

Jim — We contacted Steinberg, who said they offer a CD-ROM-based video tutorial for \$30. It's for Cubase (not Cubasis), but many of the concepts are the same. Steinberg also recommended the free 24-hour tech support service on their Web site, www.steinberg.net.

A quick Net search turned up the Ubik Music site (www.ubikmusic.com/cubase.html), where you can buy a Cubase video tutorial for \$12.95. This two-hour tape was co-produced by Steinberg US. Ubik's site also features Cubase tips.

Another good place to get tips is the alt.steinberg.cubase.newsgroup. We found it by searching on "Cubasis Audio" in the newsgroup locator www.dejanews.com.

Explicit Lyrics

Im in the intermediate stages of building a home page using HTML and I was wondering if you could give me a few suggestions about adding some background music. What I'd like to do is simply extract some music from some of my CDs and save it on my Mac as some kind of .WAV file, but the

Thomas — Those utilities are probably recording to RAM instead of to your hard disk, which is why the recording time is so limited — one minute of CD-quality stereo digital audio requires about 10MB to store. Programs like BIAS Peak (reviewed in our July/Aug '97 issue) and Macromedia SoundEdit 16 can record directly to disk and save audio files in compressed formats (RealAudio and Shockwave, respectively) that are well-suited for Internet audio delivery. (Note that eliminating vocals from a digital audio file won't reduce its size. Removing vocals — which you could only do in a gross way via destructive filtering — would just alter the sound of the file, in the same way that turning down the bass knob on your stereo could "eliminate" a kick drum.)

For more background on realtime Internet audio formats (there are many options), see our Jan/Feb '97 cover story. Our sister magazine Keyboard also did an extensive feature on Web music in its July '97 issue.

Before you start uploading audio, though, note that it's illegal to distribute music extracted from copyrighted CDs. If you're not set up to record original tunes, you might take a look at CDs

Thomas Ng
via Internet

ther in my own way. During my career as a stockbroker, I used artificial intelligence (including neural nets, fuzzy logic, and genetic algorithms) to analyze financial data. If I can convert MIDI data files to a matrix (rows and columns) of numbers, work on them using AI, and then reconvert to MIDI, I believe I can "create" new music, e.g., using genetic algorithms to evolve and mutate a song after specifying my "fitness" function. Then I can play them back through Band-in-a-Box and my synth.

Am I correct? If so, can you tell me whether I can convert/reconvert MIDI data into rows and columns of numbers (or zeros and ones). If so, what software is needed, and where can I get it?

I hope to stimulate discussion on this topic, or meet people who have done something of this sort.

Ng Tian Khean
Republic of Singapore
khean@singnet.com.sg

Ng — If you were to reduce MIDI messages to ones and zeros (bits) and rearrange them, it's extremely unlikely you'd end up with data that could produce sound. But a MIDI-processing program like Opcode Max (which we covered in our Sept/Oct '96 issue) would be ideal for this type of composition. In fact, Gary Lee Nelson, who co-wrote the Max article, has developed



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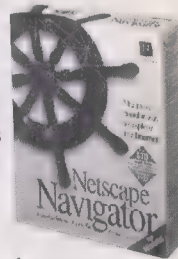
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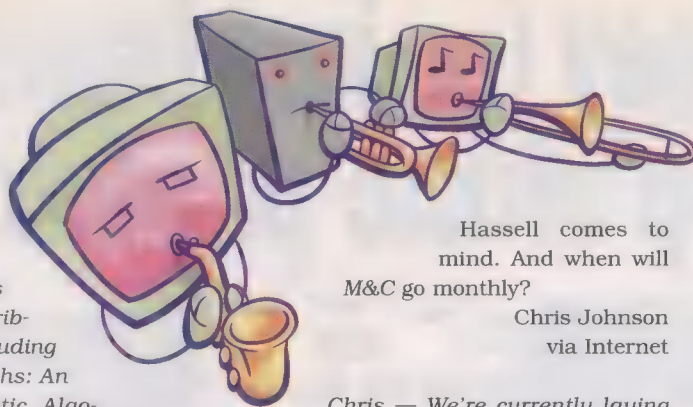
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Max objects that use genetic theory and fuzzy logic to generate music. His Web site (timara.con.obertin.edu/~gnelson/~gnelson.htm) contains several articles describing how he did it, including one called "Sonomorphs: An Application of Genetic Algorithms to the Growth and Development of Musical Organisms."

Any other suggestions, readers?

Get Down to Brass/Sax

Pm a saxophonist who is just getting into the MIDI/digital audio world, and I find your magazine to be an invaluable resource. I enjoyed the May/June '97 issue, particularly the Michael Hedges and Paul Robb interviews. Are there any plans for a focus on brass/woodwind players in M&C? Jon




Hassell comes to mind. And when will M&C go monthly?

Chris Johnson
via Internet

Chris — We're currently laying groundwork for a story on another outstanding trumpet player, though Jon Hassell would be fascinating to interview too. Our recent subscriber survey revealed that M&C readers play a wide range of instruments (in a taste of the future, "computer" was #5 on the list), so you can be sure we'll continue to cover desktop music from a variety of perspectives. For example, see this issue's story on a computer-driven live performance that involved percussion controllers, a wind controller, and MIDI guitar (page 35).

A monthly schedule is probably not too far off, given the response the magazine has been getting.

We Have A Winner!

M&C reader Bruno Pataro of New York cleaned up in our Jan/Feb '97 Alesis/Apple/Opcode Giveaway, taking home a 64-voice Alesis QS6 synthesizer, a Power Macintosh 7600, and Opcode professional music software, among many other prizes from those companies — worth over \$7,700 in all. Bruno tells us he's a classical guitarist who just got into desktop music two years ago. He looks forward to exploring new musical directions as soon as the boxes arrive. Stay tuned for more chances to win musical prizes from M&C. 



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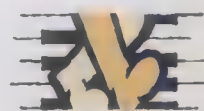
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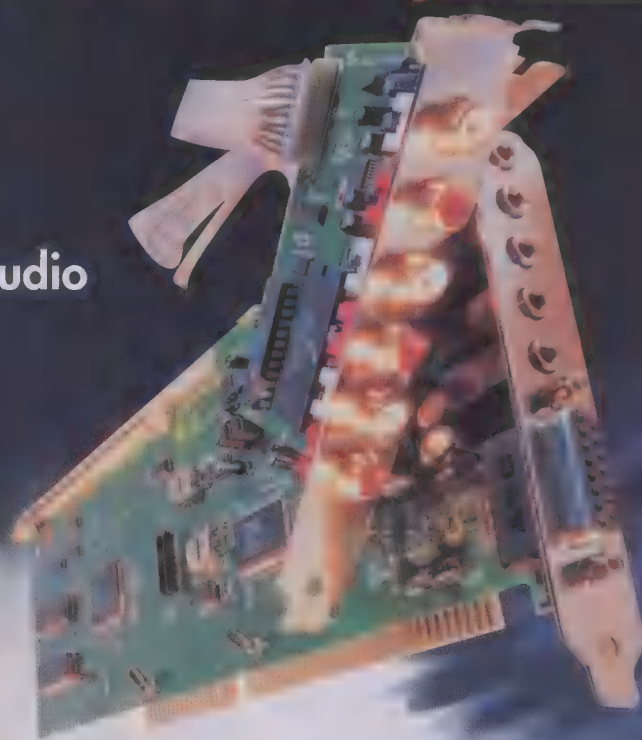
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Upgrade to 96 voice polyphony with a 32-voice daughtercard and add external synthesizers to manage up to 32 MIDI channels. Add up to 20 MB RAM for creating and downloading your own soundbanks. It's fully Plug & Play and Sound Blaster Pro compatible, and most importantly, it supports GM, GS, XG, DLS and Roland MPU-401. It's optimized for Pentiums and up, but will run great on your old 486 with a fast hard drive, no matter what your CPU.

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It's packing 4 kHz - 44.1 kHz 16-bit stereo sampling, CD-quality record and playback. It's got high-quality 16/18-bit ADC/DAC converters. It features enhanced full-duplex hardware for simultaneous record & playback and two-way conversation over the Internet. It delivers customizable 4-band parametric EQ for precise tonal control on mix-out. It boasts 2 stereo outputs that let you hear surround sound and 3D positional audio on 4 separate speakers. And it includes a digital I/O (S/P DIF - 44.1 kHz) and an analog I/O so that you can achieve pure, studio-quality fidelity.

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Cutting Edge by John Krogh & Debbie Greenberg

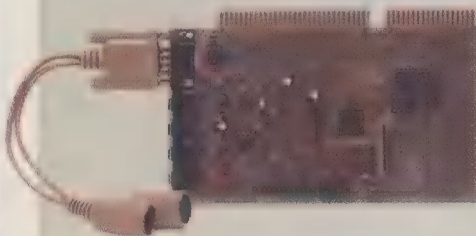
For more information about the products and companies featured in **Cutting Edge**, fill out the free Reader Service Card bound next to page 65 and drop it in the mail.



Thinking about buying a digital audio interface card for your PC? **Midiman's Dman** 16-bit ISA card (\$249.95) lets

you record audio into your computer while simultaneously playing back and monitoring tracks that you've already recorded. In addition to two stereo inputs and one stereo output, the Dman has a built-in MPU-401-compatible MIDI interface and a socket that lets you attach a wavetable daughterboard, so you can add GM/GS/XG sounds to your computer's sonic palette. For an additional \$50, Midiman will bundle the Dman card with Hohner Midia's Samplitude hard disk recording software (see page 15), giving you the hardware and software to start recording immediately.

Contact: Midiman, 45 E. Joseph St., Arcadia, CA 91006; 818-445-2842; fax: 818-445-7564; e-mail: info@midiman.net; Web: www.midiman.net. **Circle #161 on reader service card.**



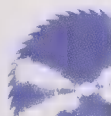
It's a sure sign that the idea of producing music with your computer is catching on in a big way when a high-end audio company like **Lexicon** comes out with a line-up of studio products directed at the desktop market. At the heart of Lexicon's desktop series is the **Core-32** card (shown below), which plugs into your computer's PCI slot. Digital audio can be recorded to and played back from your hard drive through either the **LDI-16S** or **LDI-12T** interfaces, which connect to the Core-32 card. (System price: under \$3,000.)



The LDI-16S interface offers eight channels of analog I/O on XLR connectors. TDIF-format connectors also come standard, letting you transfer digital audio to and from a TASCAM modular digital multitrack recorder such as the DA-88.

If you want to save on rack space, then check out the LDI-12T interface. This 1-rackspace box comes with optical input and output connections for any ADAT-compatible recorder, giving you eight channels of digital audio I/O. You also get S/PDIF digital audio and left/right analog I/Os.

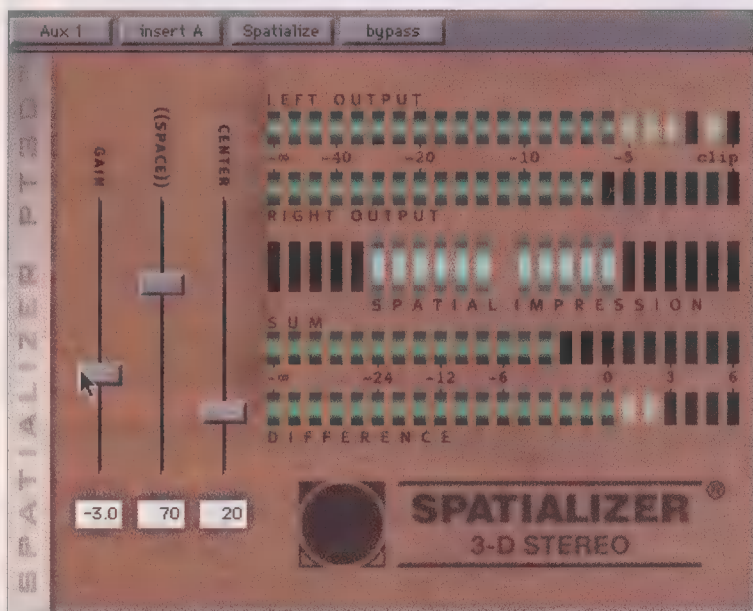
What recording would be complete without a little reverb? The **PC-90** (price TBA) daughterboard can be connected to the Core-32 card, giving you the same processing engine of Lexicon's PCM-90 effects processor. One hundred preset effects algorithms (programs) and a software interface that emulates the front panel are included (see below). **Contact:** Lexicon, 3 Oak Park, Bedford, MA 01730; 617-280-0300; fax: 617-280-0490; e-mail: info@lexicon.com; Web: www.lexicon.com. **Circle #162 on reader service card.**



Let your fingers do the slappin' with **Ensoniq's ASR-X** sampler (\$1,595). This drum machine-style box, a hybrid between Ensoniq's ASR-10 sampler and MR synthesizer, lets you digitally record phrases and sounds and play them back under MIDI control. Features include 13 velocity-sensitive trigger pads, 32-note polyphony, 2Mb RAM (upgradeable to 34Mb with standard SIMMs), a slot for adding more sounds with an Ensoniq sound expansion card, programmable effects, and a 16-track MIDI sequencer. You can sample in stereo or mono at 44.1kHz. You can also resample the ASR's outputs, creating a new sample from whatever you play. **Contact:** Ensoniq, 155 Great Valley Pkwy., P.O. Box 3035, Malvern, PA; 800-553-5151 or 610-647-3930; fax: 610-647-8908; Web: www.ensoniq.com. **Circle #163 on reader service card.**



"Three-dimensional" audio is no longer the domain of full-featured studios; now you can work some audio magic of your own with **Spatializer's PT3D** plug-in (\$399) for **Digidesign's Pro Tools** multitrack hard-disk recording software. You can apply the PT3D to mono and stereo audio files to position them in 3D space using Pro Tools' virtual mixer. The 3D audio can be played back through any stereo system — no special audio decoder is needed. **Contact:** Spatializer, 20700 Ventura Blvd., Ste. 134, Woodland Hills, CA 91364; 818-227-3370; fax: 818-227-9750. **Circle #164 on reader service card.**



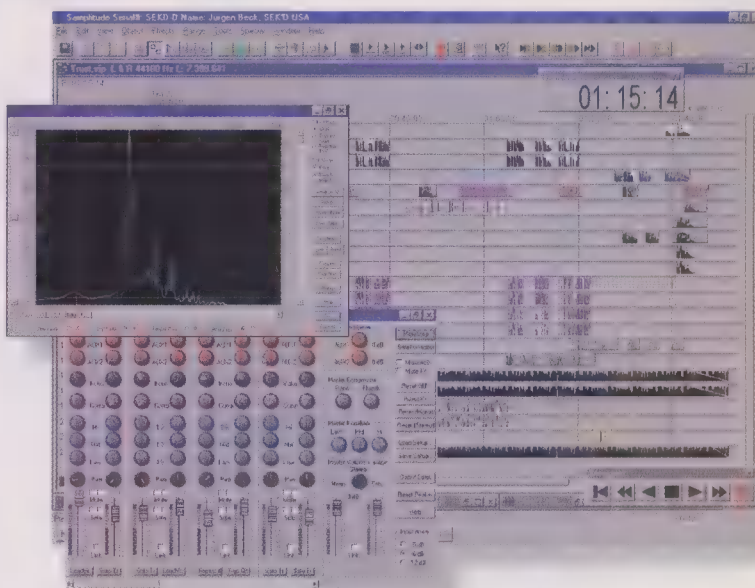
The invasion of affordable CD recorders is here and **Ricoh** has upped the ante with their **MP6200S** rewritable CD-R (\$599). Now you can record onto a CD up to 1,000 times — no more one-take mistakes and wasted CDs. The MP6200S can record at 2X speed (taking 37 minutes for a full-length CD) and read at up to 6X speed. Recorded CD-RW media are reportedly backward-compatible with existing CD-ROM players and forward-compatible with DVD players. **Contact:** Ricoh, 3001 Orchard Pkwy., San Jose, CA 95134; 408-432-8800; fax: 408-432-8372. **Circle #165 on reader service card.**



If you're tired of recording audio with your killer MIDI/digital audio card using software that offers less-than-impressive features, **Hohner Midia's Samplitude 4.0** (\$599) might be the pick-me-up you need. On this desktop multitrack recording system for Windows 3.1/95/NT, the number of tracks you can record and play back is determined by your system's resources — in short, the faster your computer and the more audio cards installed in it (that's right, it supports multiple cards), the more tracks you get. Reportedly, Pentium Pro 200MHz machines give you a maximum of 24 tracks.

Samplitude's mixer window provides realtime control over level, EQ, and pan as well as effects like reverb, distortion, and compression. A wealth of software plug-ins comes with Samplitude, including De-noising, which helps you clean up audio files, and Room Simulator, which lets you create reverb programs based on room characteristics like size, wall density, and floor surface.

Multimedia fans should appreciate the ability to import/export AVI movies and sync to SMPTE, MIDI Time Code, and MIDI Machine Control. Once you're done with a mix, you can use the TOC (Table of Contents) feature to record your own CD or

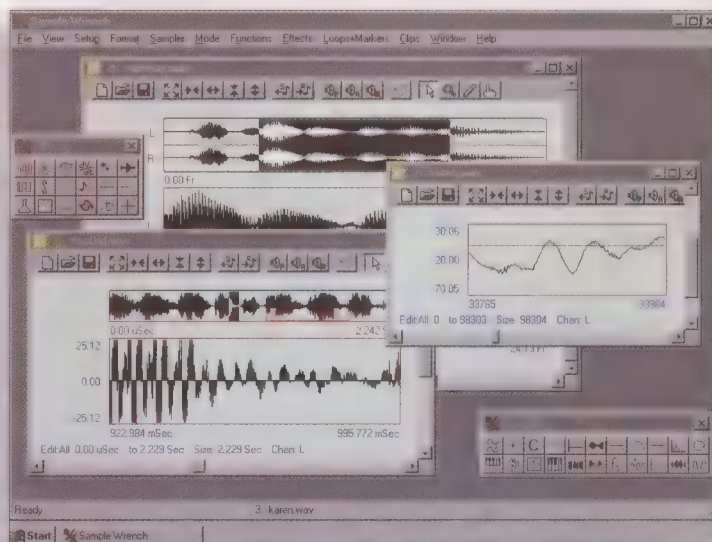


save the files in a variety of formats, including MPEG for easy Internet transfer. **Contact:** Hohner Midia USA, P.O. Box 5497, Santa Rosa, CA 95402; 800-330-7753 or 707-578-2023; fax: 707-578-2025; Web: www.hohnermidia.com. **Circle #166 on reader service card.**

Cutting Edge



Whether you design evocative sounds or just like to mutilate audio, the folks at **Dissidents** have a tool with you in mind. **Sample Wrench 4.0** (\$299) is an audio sample editor that runs under Windows 95/NT and works with most Windows-compatible soundcards. It also supports the MIDI Sample Dump Standard, which means that you can transfer sounds between your computer and a variety of external MIDI samplers, including the Akai S1000 series, Roland 700 series, and Ensoniq EPS series. Sample Wrench comes with effects such as flange, chorus, compressor/limiter/expander, and pitch-shift that you can preview in real time without altering the original audio file. **Contact:** Dissidents, 10325 Woods Rd., Utica, NY 13502; 315-797-0343; e-mail: info@dissidents.com; Web: www.dissidents.com. **Circle #167 on reader service card.**

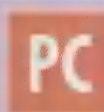


Updates



Macromedia has upgraded **Deck II**, a multitrack digital audio recording/mixing program that features continuous sync to all SMPTE formats, unlimited virtual tracks and playlists, moving-fader automation, automated punch-in and -out, realtime effects, and direct video support. **Version 2.6** (\$399; upgrade is free and can be downloaded from www.macromedia.com/deck) adds multi-processor support, simultaneous playback of up to 64 tracks, realtime multi-tap delay, and support for Apple's System 7.6.

Other enhancements include support for Korg's SoundLink DRS 1212 I/O audio interface and a plug-in architecture that lets you add support for new hardware by downloading drivers from Macromedia's Web site. **Contact:** Macromedia, 600 Townsend, San Francisco, CA 94103; 415-252-2000; fax: 415-626-0554; Web: www.macromedia.com. **Circle #168 on reader service card.**



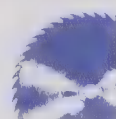
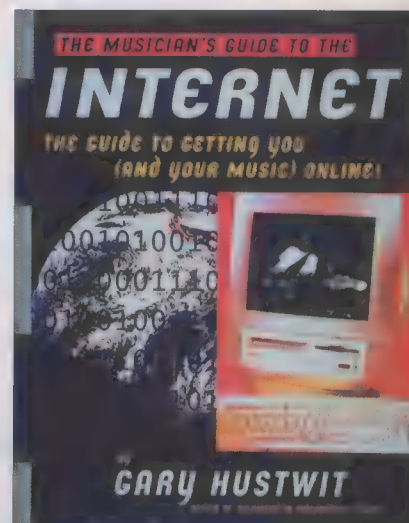
MIDI files are lighting up the **SmartLight** — the solid-body guitar from **Optek** whose fretboard lights up to show finger positions for chords and scales (reviewed in our May/June '97 issue). Previously, chord/scale exercises had to be played through Optek's own program, but with the new **SmartLight MIDI Driver 1.0**, you can use your MIDI sequencer to play along with Standard MIDI Files.

Additionally, MIDI file developer **Tune 1000** is working with Optek to provide "Smart-Light Ready" MIDI files, which contain separate guitar tracks and Easy Chord tracks for beginners. Tune 1000 MIDI files are license-free and can be purchased directly from Optek at \$24.95 per album (approximately ten songs). After you purchase six albums, the price drops to \$19.95 each. To see a list of available songs, visit www.tune1000.com. **Contact:** Optek Music Systems, P.O. Box 90485, Raleigh, NC 27675; 800-833-8306 or 919-878-7997; fax: 919-954-8389; e-mail: info@optekmusic.com; Web: www.optekmusic.com. **Circle #169 on reader service card.**



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Musicians trying to promote themselves and their bands using the Internet should find useful material in *The Musician's Guide to the Internet — The Guide to Getting You (and Your Music) Online!* (\$19.95). Author Gary Hustwit focuses on topics such as "Putting Your Music on the Internet," "Internet Radio and Streaming Audio," and "Selling Your Music Online." Those just getting caught up in the Web will also benefit, as Hustwit shows how to get online, use e-mail, create a Web site, and explore the vast amount of music-related information on the Net. Other topics covered in the 138 pages are career development, online music magazines, record labels, manufacturers and instruments, international music sites, MIDI, and music software. Look for *The Musician's Guide to the Internet* at your local bookstore or music dealer, or contact distributor Hal Leonard directly. **Contact:** Hal Leonard, 7777 W. Bluemound Rd., P.O. Box 13819, Milwaukee, WI 53213; 414-774-3630; fax: 414-774-3259; e-mail: halinfo@halleonard.com. **Circle #171 on reader service card.**

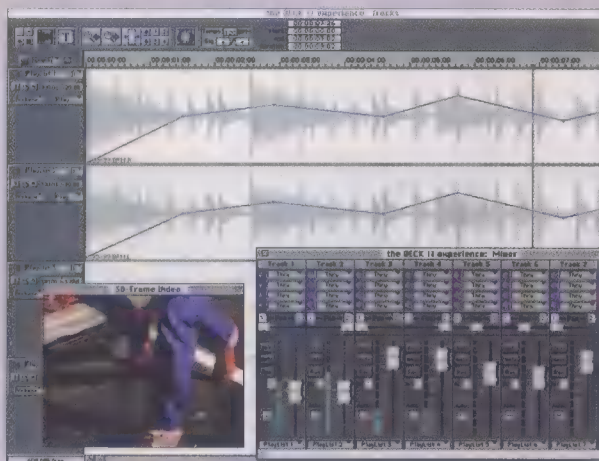
tion, multi compilation, sound effects, and world vocals. And specific audio samples and sound effects, you can enter three s and tempo information in the "Search and Download" page. Material costs \$9.95 per ZAP file (typically consisting of a loop up of multisamples). Download five or more files in a single ses- a 30% discount and ten or more for 70% off. **Contact:** East- 45 N. Maple Dr., Ste. 277, Beverly Hills, CA 90210; 310-858- x: 310-858-8795; e-mail: webmaster@eastwestsounds.com; www.soundsonline.com. **Circle #172 on reader service card.**

Cutting Edge

PC

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Updates



PC

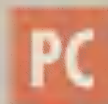


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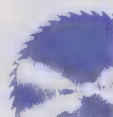
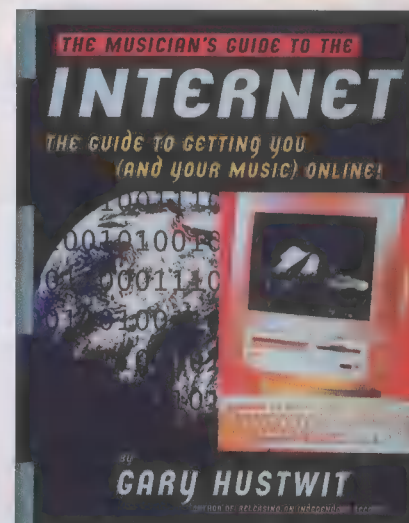
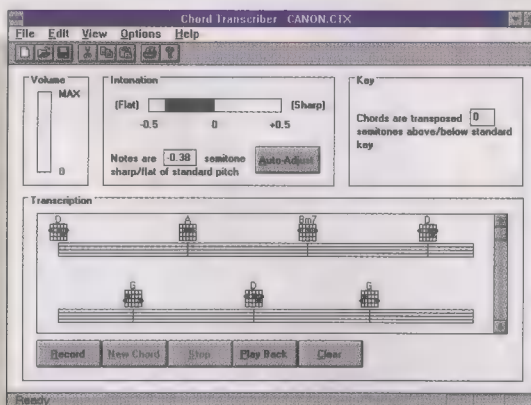
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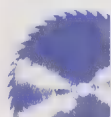


Learning tunes by ear is now easier with the **Chord Transcriber** from **Musician's Ear** (\$99). According to the manufacturer, you can record audio into your computer, then play it back using this software, which recognizes and identifies chords within the music and displays the

result in lead-sheet style with guitar fretboard diagrams. Recognized chord types include major/minor triad and seventh, dominant seventh, sixth, augmented and diminished, and seventh with a sharp/flat fifth. Chord Transcriber will correctly notate music recorded at non-standard playback speeds, transpose chords into any key, and alter chords within a transcription. You can print directly from Chord Transcriber or paste the results into other notation programs for further editing. **Contact:** Musician's Ear, P.O. Box 8556, Burlington, VT 05402; 802-863-8522; fax: 802-864-4838; e-mail: me@together.net; Web: www.together.net/~me. **Circle #170 on reader service card.**



Musicians trying to promote themselves and their bands using the Internet should find useful material in **The Musician's Guide to the Internet — The Guide to Getting You (and Your Music) Online!** (\$19.95). Author Gary Hustwit focuses on topics such as "Putting Your Music on the Internet," "Internet Radio and Streaming Audio," and "Selling Your Music Online." Those just getting caught up in the Web will also benefit, as Hustwit shows how to get online, use e-mail, create a Web site, and explore the vast amount of music-related information on the Net. Other topics covered in the 138 pages are career development, online music magazines, record labels, manufacturers and instruments, international music sites, MIDI, and music software. Look for *The Musician's Guide to the Internet* at your local bookstore or music dealer, or contact distributor Hal Leonard directly. **Contact:** Hal Leonard, 7777 W. Bluemound Rd., P.O. Box 13819, Milwaukee, WI 53213; 414-774-3630; fax: 414-774-3259; e-mail: halinfo@halleonard.com. **Circle #171 on reader service card.**



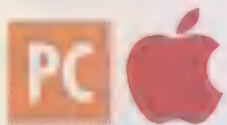
Make your sounds come to you with **East-West's** new interactive Web site, www.soundsonline.com.

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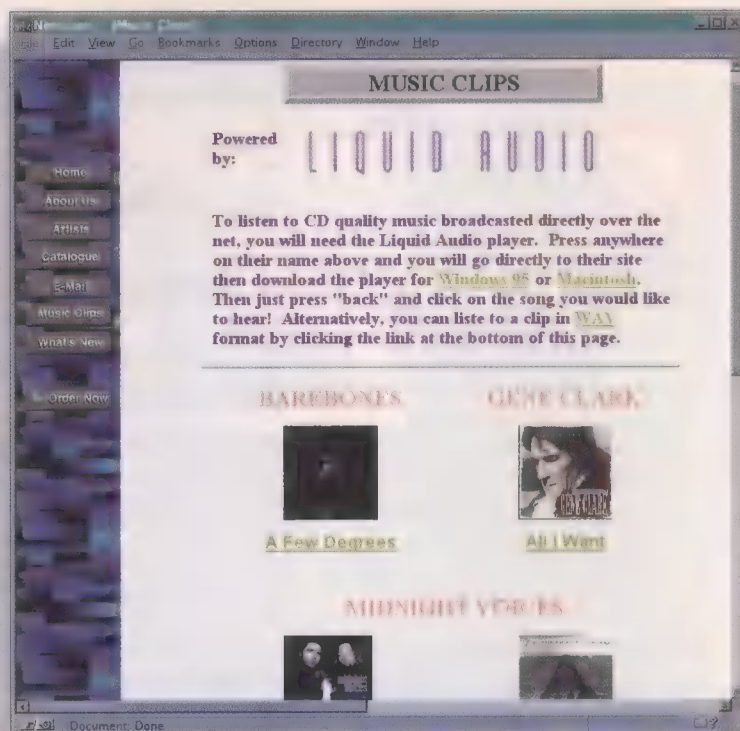
percussion, multi compilation, sound effects, and world vocals.

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Cutting Edge



In need of some bhangra rhythms and vocals, or African voices and chants? Spice up your music by choosing from the 30 sample collections in **Time+Space's** new **Creative Essentials** series (\$29.95 per volume). Each disc offers between 200 and 400 sound samples in three formats: audio, .WAV, and AIFF. The library includes everything from *Jungle Frenzy* (Vol. 13) to *Rock & Pop Vocals* (Vol. 18) to *Vintage Keys* (Vol. 26). If you're in search of sounds and textures for use in ambient dance and trance music, then *Trance Formation* (Vol. 6) might do the trick. In the slight chance you don't find something that tickles your fancy, Time+Space tells us that 20 more volumes are in the making. **Contact:** Time+Space (USA), 99 Osgood Pl., 3rd Fl., San Francisco, CA 94133; 800-411-4655 or 415-392-8933; fax: 415-392-8934; e-mail: ts.usa@ix.netcom.com. **Circle #167 on reader service card.**



Net News

Liquid Monster

The independent record label Monster Music is using technology designed by Liquid Audio to distribute artists' music at high fidelity over the Internet. Liquid Audio is a music software company with a range of products intended for publishing and distributing music via the Net. Currently, listeners can download music clips from MM's Web site (www.monstermusic.com) that will play back through LA's free MusicPlayer, available for Mac OS and Windows 95. The MusicPlayer will also display lyrics, artwork, credits, and copyright information. Copy protection and royalty tracking codes can be embedded into the Liquid Audio music files, which makes this format appealing to the mass distribution needs of record labels.

Monster Music's general manager Thad Wharton adds, "From a pure listening experience, nothing we've heard beats the audio quality of Liquid Audio... it's making the vision of Internet music distribution a reality for us." For more on Liquid Audio, see our Jan/Feb '97 cover story or visit www.liquidaudio.com.



Old School Meets the New Tool

Recording artists aren't the only ones distributing their musical wares on the Internet. Brazilian composer Dimitri Cervo has signed a publishing contract with Sunhawk Corporation to distribute scores of his original compositions from their Web site. Cervo says his compositional influences are "American, Brazilian, and Italian composers and cultures." He has studied with Italian film maker Ennio Morricone at the Accademia Chigiana of Sienna and is currently pursuing his doctoral degree at the Universidade Federal do Rio Grande do Sul. Scores and sheet music will be scanned into a computer and converted into a format that is distributable via the Internet using Sunhawk's music software. A viewer program, which

can be downloaded from Sunhawk's Web site (www.sunhawk.com), will allow you to view, print, and play posted compositions. Video, graphics, and audio can be embedded into the sheet music files so you can watch and hear the artist or composer perform a piece of music in sync with the sheet music display.

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To see and hear how Bobby Prince creates his frightening sounds and music, visit the online tutorial at www.music-and-computers.com.

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The Man Behind the Curtain... Top Computer Game Composer Bobby Prince Reveals His Secrets

You don't get to create music for blockbuster computer games like *Doom*, *Quake*, and *Duke Nukem* by going to school and sending out résumés. Nope, you start off in the karaoke business — at least, that's how Bobby Prince did it. This lawyer-turned-composer/sound designer is the unsung sonic hero of some of the most popular game titles on the market. A veteran musician and genuine music technology enthusiast, Bobby has established himself as a top-call composer in the computer gaming industry.

On any given night in any college town, you're likely to hear Bobby's music pouring through dormitory walls into the wee hours of the morning as students blow off homework for a good desktop killing spree. In fact, one of his most recent projects (*Duke Nukem*) was the number-one selling PC game of '96.

He isn't a household name, but this mild-mannered MIDI guru isn't interested in notoriety — just in having fun and scaring the bejeezus out of unsuspecting gamers. As Mike D'Amore, head

of Strategic Business Development for Yamaha, put it, "You'd never expect Bobby could come up with music this evil." How does he do it? Read on, as we pull back the curtain on Bobby's operation and get some straight talk about gear, life in the business, and how to break in.

What got you into writing music for games?

Well, I was one of the early subscribers to Prodigy. It had a lot of really good and highly trafficked bulletin boards and forums that you could sign onto. One of them that I would visit frequently was called "MIDI/Computer Music." There were tons of people on there who were interested in MIDI. There were also those of us on the bulletin board who had a good bit of experience and fancier equipment than others, so people would ask us questions and we'd share information. We started getting a lot of people who were talking about the Sound Blaster from Creative Labs. One day, a

By John Krogh

Bobby Prince

message came from a guy named Scott Miller from Apogee Software. He said he was a computer game distributor, but he didn't mention any projects that he'd worked on, just that he had some upcoming projects and was wondering if anybody'd be interested in writing music for them. I thought to myself, "This is a wannabe, somebody who's got big ideas, but I'm going to write to him anyway. I'll go along to see if it has any foundation."

Days before Scott posted his message, I had downloaded the original *Commander Keen*, which was probably the first game to put shareware gaming on the map. Not long after I sent my reply, I got a call from Scott. One of the first things he said was that he had just distributed *Commander*

There's no excuse for sitting still because you think you need a bunch of gear to create music. A four-track cassette player and an eight-note polyphonic keyboard can go a long way.

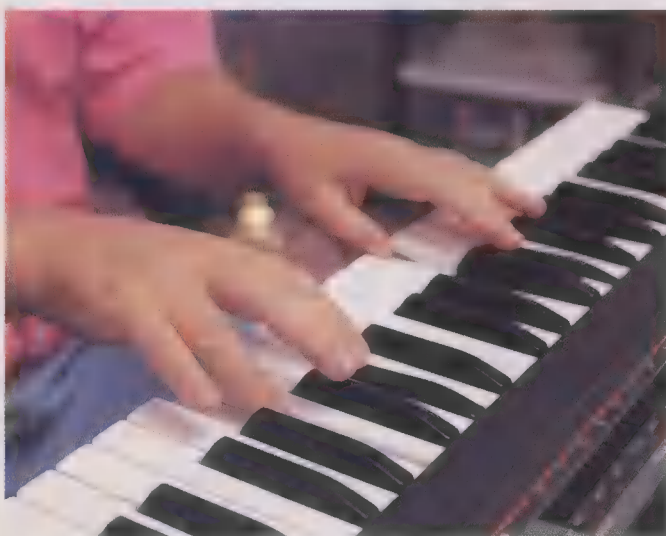
Keen, so immediately I knew that I was dealing with a better project than some of the others. He told me that out of all the people who had replied to his message, he'd been impressed by what I had written, and thought that I might be the person who could help him. He hadn't heard any of my music or even known if I was capable of doing the job! He must have had positive vibes from me; I don't know. Anyway, he explained that he had invested his last \$5,000 in getting his software

company started and independent, but that he would send me a check so I could buy a Sound Blaster. I didn't have one back then because I considered it pretty much a piece of junk compared to the samplers and keyboards I was used to working with. I bought the Sound Blaster and the software development kit for it, then went on with my business.

I didn't hear from Scott for the longest time after that. I figured that he went out of business or something tragic had happened to him. Eventually he got in touch

with me to give me the rundown on the second *Commander Keen* trilogy. At this point, no artwork had been done; he just told me that it would be more of the *Commander Keen* that I had seen in the original game. I started writing stuff that I thought would work, and as it turns out, everything I wrote got put into the game in the end.

You obviously had to have a background in MIDI and computer technology to prepare yourself for that first gig with Scott. How did you get introduced to that side of music-making?



When MIDI first came out, I didn't pay a whole lot of attention to it. My brother was one of the first people, I guess, to do what is now called karaoke. He bought one of those vocal eliminators that you see advertised in the back of *Key-board*. It worked pretty well, but sometimes he would come across songs that he couldn't remove the vocal from. So he bought an E-mu Emax sampling keyboard, thinking that maybe he could make some backing-track karaoke tapes using its built-in MIDI sequencer, although he didn't understand sequencing at all. It turns out that the Emax had a "scratch pad" sequencer with no editing. You had to get a take right the first time, or too bad! But when I saw what that thing could do, I had to have one of them myself.

If I can know whether a demon was hatched, born, or just spontaneously created, whether it had a youth, and if it cares for its kind — all those things create sound pictures in my mind.

I started doing sequences for my brother with a four-track cassette deck, the Emax, and a Boss non-MIDI drum machine, which I would use to program patterns, then record onto one track. I would overdub parts on the three remaining tracks. After I realized the limitations of the scratch-pad sequencer on the Emax, I decided to buy a computer and get it all MIDied together. That's really how I got introduced to MIDI.

It seems the best way to figure out how to learn a piece of hardware or software is to put it through its paces in a project setting instead of taking it apart academically.

Right. Working on a project forces you to use the tools that are available to you

and helps develop your chops, so to speak. What's more, having a limited amount of resources is no excuse for not going ahead and doing your thing. Saying, "If I only had an [Alesis] ADAT or the latest killer synth, I could get this project done" — there's no excuse for sitting still because you think you need a bunch of gear to create music.

If you had had a large studio setup when you first started versus building piece by piece, would you have the understanding of MIDI and digital audio that you do today?

Definitely not, especially with the complexity of today's equipment. I think it would have been totally overwhelming. The little lessons that you learn because you're limited really do come in handy

almost too much for the human mind to consider all the possibilities. I sort of felt that way, believe it or not, with the Yamaha OPL FM synthesizer [the foundation of many soundcards], because it's virtually unlimited. There were all these little nuances in it. I see that happening with DLS [downloadable sounds]. You'll be able to create your own instrument sound and write a song that goes with it. To me that's a very powerful way to write music. That's the way I did the music for *Commander Keen* and *Wolfenstein 3D*.

When I was trying to translate the *Wolfenstein* music from FM over to General MIDI sounds, I had an interesting experience. For the sound of soldiers' footsteps, I'd originally taken some instrument and played it well out of its range on the FM card.



later on. For example, I did a whole compilation of songs by Antonio Carlos Jobim with my little Boss drummer on one track, my guitar on another, and one or two tracks of keyboard. It was raw, not locked to timecode or anything. Projects like that really helped me learn proper technique for overdubbing and punching in to cover up mistakes. You know, a four-track cassette player and an eight-note polyphonic keyboard can go a long way.

Some people say they like imposing limitations on themselves to a certain degree, because it forces them to come up with creative workarounds.

Right, and to a degree, an unlimited palette is a little bit scary because it's

But when I ported my music over for General MIDI, there wasn't a comparable sound. I thought, "What am I gonna do?" So I started playing all of the General MIDI patches well out of their ranges, and son of a gun if the "gunshot" patch didn't turn out to do the job. If you play a note quickly in its low register, not letting it get into the ricochet portion of the sound, it sounds just like soldiers marching. Problem solved.

When you sit down to write music, what do you start with?

I really don't follow any one method. Sometimes a melody will just pop into my head — usually the melody and the chord structure is just sitting there. I find that the more I know about a project, the more

Bobby Prince

storyline there is, the easier it is for me to get going. The music just pops into my head. It's the same for sound effects for particular demons or whatever — weapons and that sort of thing. Using *Doom* as an example, Tom Hall [from Id Software] had written what was called the "Doom Bible," which was his early work on that project where he developed characters, demons, and weapons. Basically, he had laid out a good part of *Doom* in about a 50-page script. After reading it, I sat down and roughed out most of the sound effects.

In the original concept, *Doom* was going to start with a cinematic of these women in the Marines sitting around a table playing cards. All of the sudden, they hear a loud explosion that takes them away from their game. A Marine who's been hideously disfigured comes into the room and moans something, then falls to the floor.

Projects where people have laid out a storyline like that are easier for me. If I can know whether a demon was hatched, born, or just spontaneously created, whether it had a youth, and if it cares for its kind — all those things create sound pictures in my mind. What's really strange is that most of the time my first attempts at music and sounds are the ones that end up being used in the final project. It seems the more you work on something, the less spontaneous and the more formulaic it becomes.

Once you start writing music, do you present your "works-in-progress" to the developers?

That's one thing that I've learned over the years: Never present a partially completed song. Never, ever. I just won't do it, because I can't assume that someone will hear in their head where I'm going with it and how it will sound in the end. I've had people scream at me because they wanted it, and I've had some really nice songs turned down on a project because I gave them to clients early on, only to have them accepted with open arms by the next project that was similar. Another reason I won't do it is because a lot of developers still have horrible sound equipment. I don't see the point in taking the risk with something that isn't complete.

When you're responsible for both sound design and music, which do you work on first?

I usually do both sort of at the same time. One is oftentimes a retreat from the other

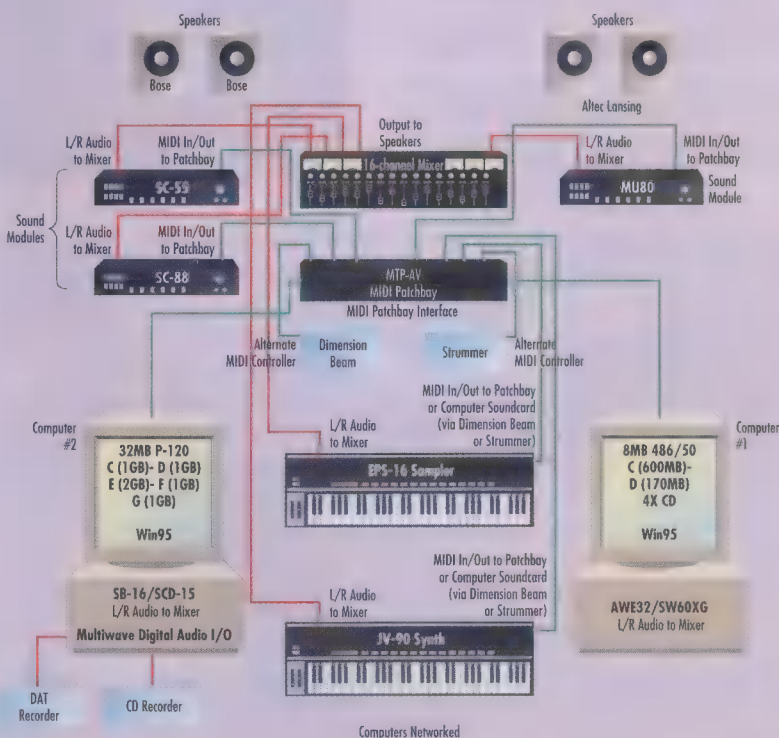
A Studio Fit for a Prince

Bobby Prince's studio setup includes an Ensoniq EPS 12-bit sampler that he used exclusively for recording the *Wolfenstein 3D* sound effects. He notes, "All of the effects were recorded using a Neumann TLM170 going through a Symetrix 525 compressor/limiter into the EPS." His other MIDI keyboard is a Roland JV-90, which is used mostly for inputting parts into Cakewalk. The Dimension Beam MIDI controller (one of Bobby's favorite input devices) from Interactive Light is used primarily for pitch-bending and other MIDI effects. (The Dimension Beam is a MIDI device that emits an infrared light ray that you can move through to generate MIDI messages. For example, by passing your hand through the field, you can create a filter sweep.)

Input devices are connected to a Mark of the Unicorn MIDI Timepiece, an 8-port, 128-channel MIDI interface that routes MIDI data to and from Bobby's computers and sound modules. These include Roland SC-55 and SC-88 Pro Sound Canvases, a Yamaha MU80, several E-mu Proteus modules, and a Korg M3R.

At the microprocessing heart of Bobby's studio are two computers that are networked through Windows 95: a 50MHz 486 with a Creative Labs AWE32 soundcard and Yamaha DB50XG daughterboard, and a Pentium 120 with a Creative Labs Sound Blaster 16 soundcard and Roland SCD-15 daughterboard. The Pentium also contains a digital audio I/O card from A dB that is connected to a DAT deck, which is used for recording sounds onto the hard drive. For archiving tasks, he uses a Yamaha 4X recordable CD-ROM drive.

Digital audio editing is handled by several programs, including Syntrillium Cool Edit, Sonic Foundry Sound Forge, and Steinberg WaveLab. The main MIDI sequencing is done with Cakewalk Pro Audio; however, PG Music's Band-in-a-Box and Power Tracks are also used for working out ideas and checking for polyphony problems.



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Bobby Prince

when it just doesn't seem like things are going right. Also, I think it actually helps to be doing both at the same time because it keeps your head in the mindset of the game at all times.

The Fat Man often writes music with other players or with his band, Team Fat. Do you work with other musicians at all?

Nope, not really. It's just me. There have been occasions when I've tried other people, and it turned out to be a horrible experience. I underestimated what you've got to know to do this stuff, from the standpoint of getting a file ready to go into a game. It was always more trouble to explain to the person what I needed, and by the time I did, I could have done it myself. Most musicians think, "Oh! It's simple. I just deliver a MIDI file." Wrong.

With *Wolfenstein*, I would write the stuff the way I wanted it, then I'd have to go into my MIDI sequencer and make sure that only nine notes were playing at any one time and that no notes on a single track overlapped [so as not to overwhelm the soundcard]. I had to do all this in [Voyetra] Sequencer Plus Gold, which did not have an event-list window, only a piano roll that displayed one track at a time. You had to click on the individual note — what looked like a

hole in the piano roll — to see what the values were, and then shorten the length so that it didn't carry over onto the next note. That was something that was hard to explain to myself, much less to anyone else. Some of the songs that I've done for games were done by other people I hired, but they just did not know how to make it work given the limitations. I threw my hands up and completely rewrote the songs to work for FM or General MIDI and that sort of thing.

Speaking of overlapping notes, at the Computer Game Developers' Conference, Don Griffin spoke about the importance of traditional composition — notating your music on the page. One of the benefits of working that way, according to him, was that you could see on paper where notes are sustaining and cutting off before you enter anything into your sequencer. Do you take this approach?

No, generally I have not been a notation-oriented person. I use a \$29 program from PG Music called Power Tracks Pro, which is a killer sequencer that will point out wherever notes are overlapping on the same track. It's really handy if you're worried about polyphony, and you still have to be when you're talking about MIDI playback on a computer.

You have a knack for making your music sound realistic in terms of the



I recorded myself strumming guitar into my computer, then looked at the timing of each string and emulated that timing in my sequencer.

individual instrument parts — especially your guitar programming. What's your secret?

You have to know the voicings and techniques that musicians use to play their instruments. I learned to do this back before MIDI. For years I played in bands with horn sections, and I always wanted to do Chicago tunes and songs that had really cool horn parts. I would transcribe the songs with individual instrument charts. I used to learn guitar solos and listen to their arpeggios and things like that. I would put some kind of light oil on my finger and drag my finger on the edge of a record to slow it down to where I could hear the parts.

It sounds like you really developed your ears.

Yeah. All of those things, which probably sound very boring to the average person, were exciting to me and paid off in spades, as they say, when it came to creating my own compositions. 🐾

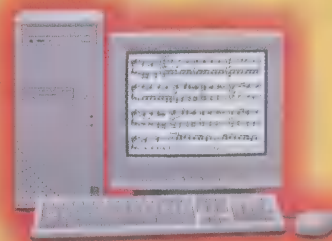


Fig. 1. By zooming in on a region of guitar strumming that he had recorded into Sonic Foundry Sound Forge, Bobby determined exactly when certain guitar strings were struck. With this timing information, he was able to reproduce his strumming feel using MIDI by editing the start times of sequenced guitar chords in Cakewalk.

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Bobby Prince

Since you're primarily a guitar player, do you sequence with a MIDI guitar controller?

No. I have some CAL (Cakewalk Application Language) routines that do some pretty realistic guitar strums. They're actually patterned after me. I recorded myself strumming into my computer, then slowed the digital audio file down, looked at the timing of each string as it was strummed, and emulated that timing in my sequencer. [See Figure 1 on page 26.] I have another CAL routine for pitch-bending. [See "Bobby's Bends" below.]

Which do you do more often when you sequence, step-time or realtime entry?

Realtime all the time. Even if it's two measures at a time. If it's something that's really haul-ass speed, I'll just play it over and over 'til I feel comfortable with it, then record it. If it fits, I just leave it alone. I've found that if you get the bass and the kick drum quantized together, the tracks that you overdub seem to just lock in without needing to use quantization.

Since you said you can't just drop off a MIDI file, what do you need to do



with your files to get them ready for final delivery?

That depends upon the sound engine [the software that handles MIDI and digital audio playback] that the game uses. Generally it requires making sure that the music sounds good when played through this piece of software on several different devices. I have two computers

[see "A Studio Fit for a Prince" on page 24] that are networked with Windows 95, and I keep two different soundcards, both with different daughterboards that I consider more or less representative of what's out there: a Creative Labs AWE32 and Sound Blaster 16 — which is probably the most popular card out there — and the Roland Sound Canvas SCD-15

Bobby's Bends

Using pitch-bends in real time is a great way to add expressiveness when recording MIDI tracks. Pitch-bends aren't hard to perform if you move the pitch wheel all the way up or down, but creating realistic bends by operating somewhere in between isn't always easy.

To get around this problem, Bobby Prince has a couple of CAL (Cakewalk Application Language) routines that will change the amount of pitch-bend to any interval, which allows him to use the full range of the pitch wheel when recording guitar parts. He then applies the CAL routines for each pitch-bend, specifying the interval that the bend should go up or down to.

Figure 2 shows a pitch-bend that goes up and back down by two semitones. After the CAL routines are applied, the resulting pitch-bend (Figure 3) goes up and down by eight semitones.

Cakewalk Application Language is a MIDI event-processing language that you can use to extend the functions of the Cakewalk sequencer. CAL routines are a series of commands, keystrokes, and mouse actions specific to Cakewalk that are initiated with a simple command. With CAL, you can automate Cakewalk functions like scaling pitch-bend information and randomizing MIDI event start times. ▀

Fig. 2.

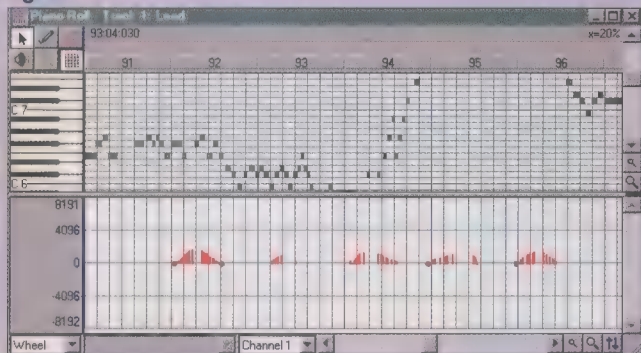
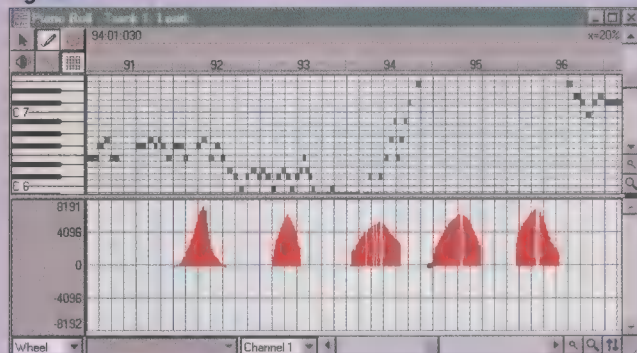


Fig. 3.



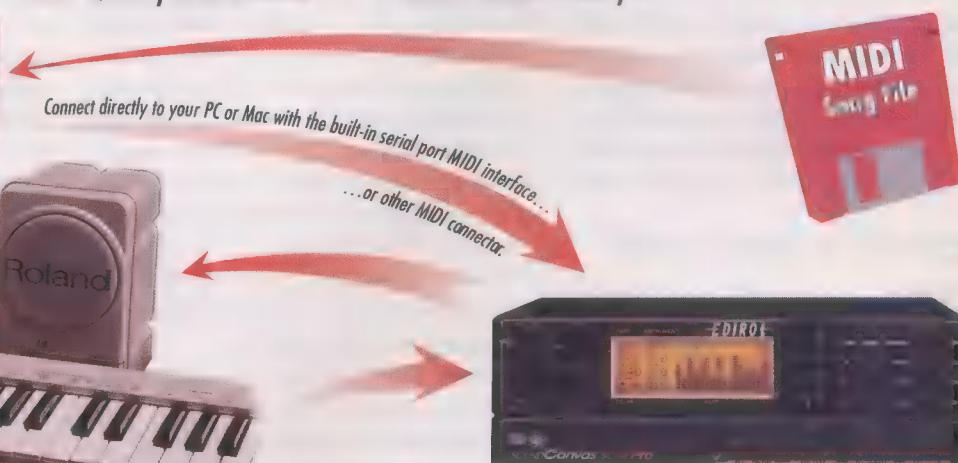
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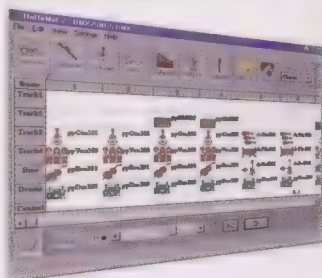


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Bobby Prince

and Yamaha DB50XG daughterboards. I listen to the music using a custom sound driver that the developers give me, a player program that will play the MIDI file on those different devices I just mentioned.

A lot of times it requires inventing your own FM instrument sound to emulate a particular General MIDI instrument sound. Let's take, for example, a low-octave guitar patch [sound]. If you're using the standard Windows FM instrument set for playback, that patch might sound horrible on a particular song. So what you do is replace that with your own custom guitar patch that sounds good in the range that it's in for that song. There are certain sound engines that will allow you to earmark tracks for particular soundcards. By doing so, you could have a file that is only going to be played if you have an FM synthesizer,

I carry a portable DAT recorder with me for collecting sounds. Sometimes it'll be just a chair I'll sit in that'll squeak really neat.

and another one that's only going to be played if you have a Roland GS or Korg XG module.

So you have multiple versions of the same music file, and each one has slight changes to accommodate strengths and weaknesses of a specific playback device?

Exactly. For instance, if the FM device is slow, then you'd adjust the MIDI data so it would play sooner, whereas that wouldn't sound good at all on a Roland module, so you would mark one version to play if you have an FM sound source and another version to play if you're using Roland GS. Another thing I do a lot is edit note velocities in different files. Really, way too much of my time is taken up with creating alternate files for those situations. It's boring and no fun at all. The day that a person can just deliver a MIDI file will be a really nice day.

Let's talk about digital audio a bit. What tools do you use for creating and editing your sound effects?

I use WaveLab from Steinberg. [Ed. Note: You can download a demo version of WaveLab from www.steinberg.net.] It does the best job of time compression and expansion of any program that I've ever heard. I took a sample of my wife's voice saying something for a rough demo voice-over. I sped it up to play in 50% of the time, and it sounded just like her, only faster. No echo or aliasing like what you



find with a lot of audio editing programs. My philosophy is to use a program for its strengths, and if [Sonic Foundry] Sound Forge will do the job, great. I still use [Syntrillium] Cool Edit a lot, though,

because I have batch-file routines already built and I don't want to have to reinvent the wheel to achieve the same thing with Sound Forge. Cool Edit has the best scripting of any program I've ever used, although Sound Forge is going great guns.

[Ed. Note: You can download Cool Edit free from www.syntrillium.com. A batch-file routine is a set of software operations (like swapping fonts and changing line spacing in a text document) that can be performed on multiple files (a batch) with a single command. Some programs let you script, or create your own, batch-file routines, meaning that you can record and save a group of operations that can later be initiated for all of the files you choose. In other words, batch processing lets you automate certain repetitive software tasks.]

Are you doing a lot of file conversion (from 16-bit stereo to 8-bit mono) with Cool Edit because you're preparing files to go into the game?

No, it's more for cleaning up sound effects. In *Duke Nukem*, for example, there were certain things that I had to do to the voice from the DAT tapes. There was a particularly annoying signal that was

Bobby's Buying Tips

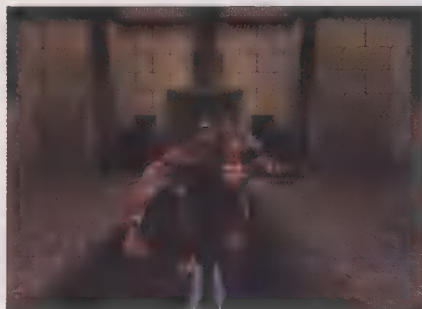
Okay, you budding game composers, if you want to break into the biz, you're going to need a few things. Bobby Prince advises that people who are really new to music technology stay away from software sequencers that integrate MIDI and digital audio. As he puts it, "You can always upgrade to a full-featured program later on. It's better to learn the MIDI end of things first and add audio later."

What you'll need to get started:

1. A Sound Blaster 16- or AWE32-compatible soundcard (for General MIDI playback) with a daughterboard that offers a Roland GS soundset or a Yamaha XG soundset.
2. A MIDI keyboard with a pitch wheel, modulation wheel (or joystick/lever), and channel aftertouch.

3. A MIDI interface (either dedicated or via the soundcard).
4. A software sequencer.
5. A mid-level pair of speakers and comfortable headphones for monitoring.

A modest studio setup that includes these items will help you cover the bases when it comes to composing music for computer games. The important thing to remember when putting together a starter MIDI music system is to choose equipment that is representative of what the end user has sitting inside their PC. Having GM, GS, and XG soundsets is going to serve you better than having a rack full of specialized gear. (For more on putting a MIDI music system together, see *Mysteries of MIDI* on page 69; for more on choosing monitors, see "How To Buy & Set Up Studio Speakers" on page 59.)



accidentally recorded along with the voice track. I basically filtered it out without getting rid of the balls and the guy's voice. I also normalized the audio levels [set them to the maximum value] to make it easier for me to work with.

What kinds of sampled sounds work well for the projects you do?

Generally, animal sounds are the absolute *best* raw material you can have for games like *Doom* — really, for any science fiction or any kind of otherworldly stuff with demons or aliens. Almost every trip I take, I carry a portable DAT recorder with me for collecting sounds. Sometimes it'll be just a chair I'll sit in that'll squeak really neat. I'll sit and record that for a minute or so. Stuff like that really comes in handy. Of course I use material from CD-ROM sample libraries as well, but I like to create my own sounds more.

You use so many different tools and have obviously become proficient with all of them. That must take up a lot of mental real estate.

Yeah, it does. With this job, a lot of times you're spending more time getting ready to do what you really want to do than actually doing it — adjusting the attack of a sound, getting sidetracked on trying to get the CD-ROM recorder to work with the latest driver, and blah blah blah. That's the reason, as far as equipment goes, I keep it very simple. I rent what I need. If I do an all-digital project, I go to a local studio



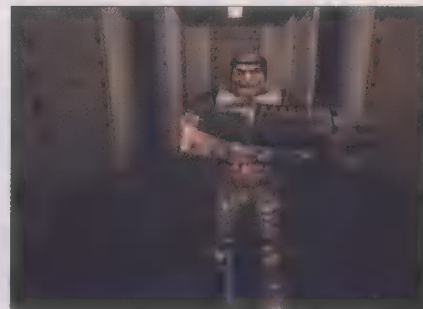
and use state-of-the-art stuff. That way I don't have stuff sitting around gathering dust when I'm not using it.

So you don't have an ADAT [digital multitrack tape recorder] or anything along those lines?

Nope. Sure don't. I've had one of about every keyboard that's ever been made, and all sorts of modules and that sort of thing, but I find that I really don't need them for what I'm doing. As far as writing the music, I could do that on a Sound Blaster 16 with a Roland SCD-15 daughterboard and have very successful results when I listen to it on the other devices.

Any advice to budding composers/sound designers?


Well, the one question I probably get asked the most is, "What is the secret to getting into writing music for games?" I tell them three things almost to the letter: First, the secret is to know your equipment. If you hear the music, you need to know how to get it out using the equipment that you have available. Second, find a talented group of programmers/game designers who are just starting out who might not have the money to pay you up front, but who are willing to work out an arrangement so that you get paid later or you get royalties off of the game. It's the best way for other people to learn about what you do. You tend to get more business from that than anything. Finally, get involved in two associations: the International Game



Developers' Network and the Computer Game Developers' Association. Through organizations like these, you'll get to meet so many people, which is important because people typically want to work with people they've met.

Other than that, I'm just a person who believes that you can't push anything. You can put yourself out there and let the world know what you would like to do, but unless it's right, it's not going to happen. Let's say I wanted to do a film score and I went to Hollywood. I could take

The little lessons that you learn because you're limited gear-wise really do come in handy later on.

all the things that I've worked on and push it in people's faces. In the end I may get something, but it might be something I wish I never was involved in. Whereas if you just do a good job on the projects you work on and put your heart into them, people will come to you because they know that you'll bring those qualities to their project. That's the best advice I can give anybody. 



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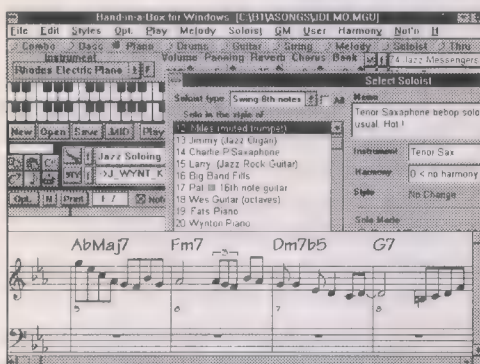
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By Paul D. Lehrman



Computers Come Alive!

**The Making of
"King Frank"**

**A Live-Performance
Piece for Six Players,
Four Samplers, One
Computer, and One Late,
Great Composer**

Computers are great for helping out with home and office tasks, but why would anyone ever dream of hauling one onstage as a bandmate? Because desktop computers offer new possibilities when it comes to live music. Thanks to MIDI, sequencers, and sampling technology, a keypress or breath of air can translate into a whole universe of musical (or non-musical) sounds. What might look like one kind of instrument onstage might sound like

something completely different, or not even an instrument at all. The identity of an instrument can change from moment to moment.

The concept of sharing the stage with a computer raises many questions; the first is often, "Who's in charge here?" How much control of the performance do you want to keep in your own hands, and how much do you want to give to the machine? At one end of the scale, the computer does all the work and the performer is basically irrelevant, or

Computers Come Alive!

at least ignored by the machine. At the other end, the performer is in control all the time, and the computer does nothing unless the performer tells it to.

"King Frank," a piece I conceived and composed recently for myself and five other players, lies somewhere between these extremes. In this piece, the computer and musicians play off of each other, and the performance control switches back and forth, sometimes in ways that the audience can see, and sometimes not. It's in this middle ground that the most exciting possibilities for computer-assisted performance lie.

Not too many years ago, a project of this complexity and flexibility would have required custom programming on a large computer, using state-of-the-art sampling technology and special "gesture" MIDI controllers. But I created "King Frank" with off-the-shelf hardware and software, at the hub of which was a five-year-old computer.

You Are What You Is

"King Frank" is a tribute to the late Frank Zappa that borrows heavily from Zappa's body of recorded works. I developed it as a term project for the students in my advanced Computer Applications in Music seminar, in the Sound Recording Technology program at the University of Massachusetts, Lowell. We performed the piece as part of a concert consisting of student MIDI and digital audio compositions.

At the heart of "King Frank" is "King Kong," a fast, 3/4 modal jazz tune originally on the Mothers Of Invention's *Uncle Meat*.

A lot of "King Frank" borrowed from standard jazz structure: The piece started with an introduction and a statement of the tune, followed by each of us "blowing" a solo on the tune — the last solo being, of course, drums. The six performers used various MIDI controllers — two keyboards, guitar, horn, and two drum pads — to play the melody, fill in harmonies, and solo while the MIDI sequencer running on the computer provided basic rhythm tracks.

Instead of playing MIDI synthesizers, most of us played samplers so that we could switch between normal instrument sounds

What the Audience Didn't See

One of the most difficult jobs in the creation of "King Frank" was working out the MIDI signal routing. We were faced with an interesting problem: All of the tone-generating instruments needed to be under the control of both the musician and the computer (which was playing sequences and sending program changes), but you can't easily split and combine MIDI signals the way you can audio signals in a mixer. Filtering everything through the sequencer wasn't an option, because Vision only allows one Thru channel — all incoming MIDI data is re-routed and output only to the instrument specified on that channel.

We were able to overcome this shortage of simultaneously available channels by using the built-in cable-routing and data-filtering features of Mark of the Unicorn's MIDI Timepiece interface, which allows the sequencer to address multiple instruments on several MIDI cables. (See Figure 1.) A lot of mid- to high-end MIDI interfaces offer this kind of flexibility, but most people never bother with these functions and simply use the box as a multi-cable interface. Among other capabilities, the MTP lets you route data from any of the eight incoming MIDI ports to the serial port on the host computer and/or to any of the eight outgoing MIDI ports. At the same time, you can "channel-map" (alter the MIDI channel of) all data going into or coming out of any of the ports.

The Casio MIDI horn I played was routed through the MTP to my K2000. The MTP had a channel map on the incoming signals, which converted everything to channel 1. (See Figure 2.) Brian's MIDI guitar was routed to the K2000 he was sharing with Claus, also with a channel map on it, set to channel 2. Claus played the K2000 with *local control* turned on, meaning that it responded directly to what he played on the keyboard. There was no need for the MIDI notes Claus was playing to go anywhere outside of his instrument, so

Continued on page 38

The concept of sharing the stage with a computer raises many questions. The first is often, "Who's in charge here?"

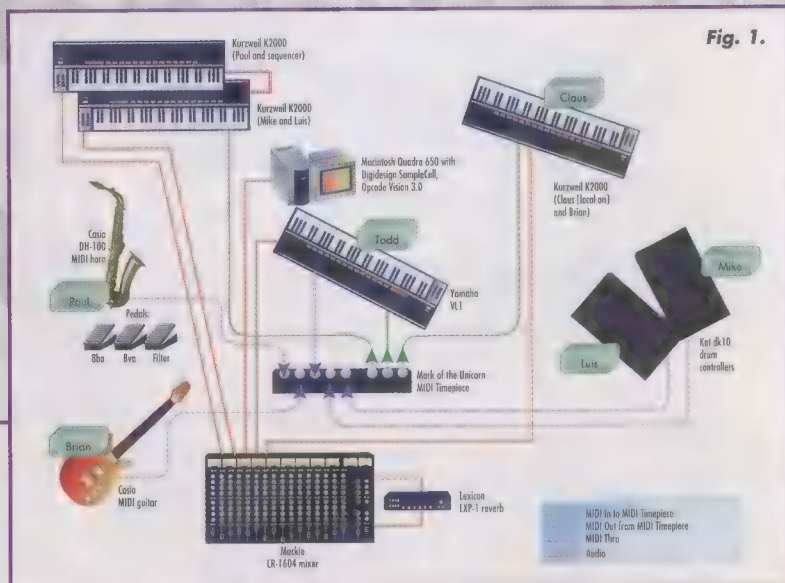


Fig. 1.

All of the instruments needed to be under the control of both the musician and the computer, but you can't easily split and combine MIDI signals.

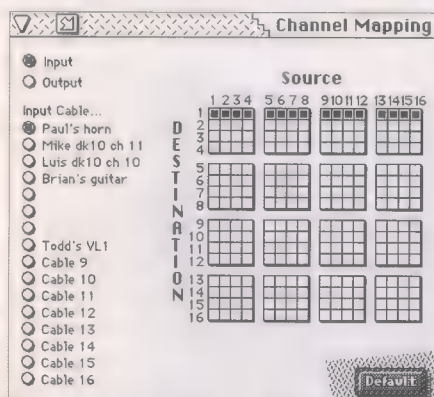


Fig. 2. A channel filter was used on the MIDI output from Paul's horn to ensure that it played the correct channel on the receiving synth, regardless of what channel the horn was transmitting on. Similar filters are used on Brian's guitar and the two drum controllers. This screenshot is from the software that configures the MOTU MIDI Timepiece interface.

and non-instrumental samples instantaneously. The idea was for the tune to evolve as a collage of harmonic material and what can only be described as audio mayhem. At various points in the piece, the music would stop dead and the audience would hear sampled phrases from a Zappa record such as, "The way I see it Barry, this could be a very dynamite show!" We called these interludes "*samplus interruptus*." Besides being funny, they kept both the performers and the audience on their toes.

During a free-form section that followed our solos, we bombarded the listeners with odd phrases, noises, sound effects, and loops from Zappa records until we reached a glorious cacophony. Following this wall of sound, we went into a "trading 8's" section — exchanging eight-bar solos over the tune's chord changes. But from the audience's standpoint, it seemed that we had emerged from the preceding chaos with all the *wrong* sounds! The drummer was playing a guitar, the guy at

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the keyboard was playing the flute, and the sax player was playing, of all things, a sitar! Indeed, we weren't just trading licks; for the moment we had swapped instruments, and the sounds each of us played in our little solos bore no physical resemblance to the instruments we were actually playing.

After another *interruptus* from Frank, we launched into the head (main melody) one final time, with all the instrument sounds apparently back where they belonged.

Continued from page 36

there was no MIDI Out cable from it to the MIDI Timepiece. Luis's and Mike's Kat dk10 drum pads were routed to channels 10 and 11 in the K2000 they were sharing. The only input device routed into the computer (and therefore the sequencer) was Todd's VL1, so that he could play SampleCell from it.

The MIDI output from the computer — that is, the sequencer's output — was routed to all of the K2000s, as well as to the VL1, so that the sequencer could send program changes to everybody. To save on MIDI cables, the K2000 that was handling the rhythm tracks (which took up four MIDI channels), the *interruptus* samples, and my sax was connected to the MIDI Thru jack of the K2000 that Mike and Luis were playing. That meant that we couldn't use any of the same MIDI channels on the two synths, and that all of the channels being used on one machine had to be disabled on the other.

The show came off smoothly, but it didn't just happen that way. Behind our performance was a good deal of planning, creative routing of MIDI signals, and a twisted set of samples to top it all off.

Sharewhere

Probably the most involved aspect of our performance was how we shared the samplers and MIDI controllers with the computer and each other. Each player had one MIDI input device (see Figure 1 on page 36), but not necessarily a tone generator of his own.

Three Kurzweil K2000S sampling keyboards and a Digidesign SampleCell card, which lives inside the computer, were called into service as sound sources. The K2000S samplers were configured so that each of them functioned as two distinct instruments: The keyboard that Claus

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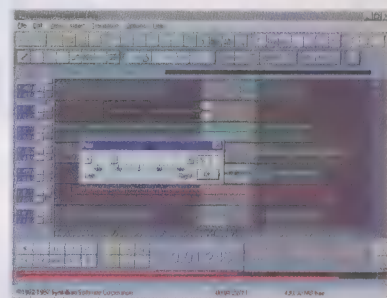
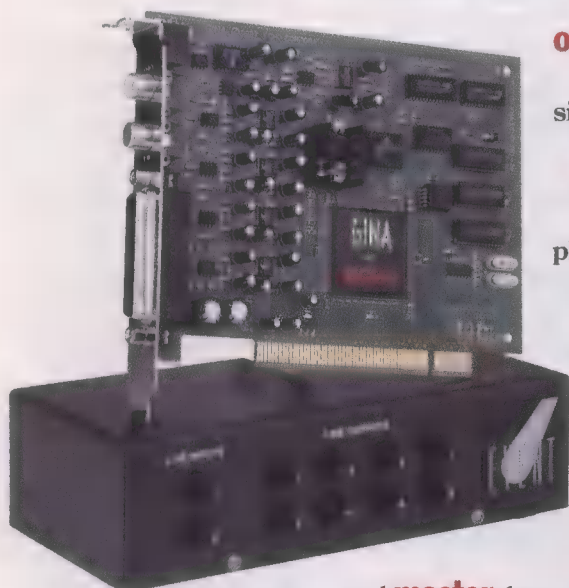
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was playing had one MIDI channel devoted to his sounds, while a second channel produced the sounds that Brian was playing from his guitar. Similarly, the two drummers shared another K2000, each with his own MIDI channel and his own stereo audio output. The third K2000 was shared by my MIDI horn and the sequencer itself, which played the *interruptus* samples and backing tracks. Todd triggered sounds from the SampleCell card by routing MIDI signals from his Yamaha VL1 keyboard to the card with the sequencer's Thru function (which allows incoming

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MIDI signals to be passed through the computer to a receiving MIDI device).

Queue the Cues

We were running Opcode's Vision 3.0.1 MIDI sequencing software on a Macintosh Quadra 650 for the entire piece. Vision allows multiple sequences to be loaded at the same time and played in any order by cueing them from the Macintosh keyboard — this was part of Todd's job. We had separate sequences for the 16-bar introduction, head, instrumental solos, and each of the special sections.

Vision's cue functions gave us an edge: If you cue up a second sequence while another is playing, the second one will wait for the first to finish, then start immediately. So when sequences needed to be strung together without interruption, as when the introduction ended and the head began, Todd could pre-cue the second sequence, and it would start automatically at exactly the right time.

But there were times when we wanted the computer to follow us, like after the *samplus interruptus* sequences. We made those sequences very short — one eighth-note in

Ample Samples

A sampler is an instrument containing a chunk of Random Access Memory (RAM) into which digital recordings of sounds can be loaded. These sounds can then be played back using MIDI note commands. Because samplers are MIDI instruments, most can modify sounds as they are played back in response to MIDI controller messages. For example, you can change the volume with a footpedal, or alter the pitch with a pitch-bend wheel.

We used two different types of instruments to play samples for "King Frank." The first was a Kurzweil K2000S MIDI synthesizer with sampling capabilities. The other instrument was a Digidesign SampleCell, which is a card that plugs into a slot inside of a Macintosh. (Both PCI and NuBus versions are available.) You can't play its sounds directly with a keyboard. Instead, you need to route MIDI information to it using the computer's operating system. OMS, the MIDI operating system extension from Opcode, includes a SampleCell driver, so that MIDI programs like Opcode Vision (and connected MIDI input devices) can trigger and control the sounds in SampleCell.

The Samples. Several stages were needed to capture and organize the samples for the "*samplus interruptus*" and "Sample Hell" sections in "King Frank." First, I listened to my collection of Zappa CDs to find appropriate little gems. Next, I needed to record and save the samples that I would later organize into programs in my K2000. I had a couple of options: Extract the digital audio from the discs using my Mac's internal CD-ROM drive and FWB's CDT Remote software, which allows you to save audio as AIFF files; or record the audio into my computer using Digidesign's Sound Designer II audio recording/editing software.

As it happens, I own a consumer-model JVC CD player that has S/PDIF digital-audio outputs. Since extracting audio with my less-than-new Mac takes a while, I opted to use the JVC and record the "old-fashioned" way. I connected its outputs to the digital inputs on a Digidesign Pro Tools audio interface, and launched Sound Designer II. I put the software in *monitor* mode, which lets you hear audio signals as they come into the computer to be recorded. That way, when I encountered a sample I liked, I simply backed up the CD a few seconds (using the JVC's remote, so I didn't even have to sit up), then recorded the audio to my hard drive.

Unfortunately, Sound Designer II doesn't let you send files to an external sampler, which meant I had to find a way to get these pearls into my Kurzweil K2000.

Continued on page 42

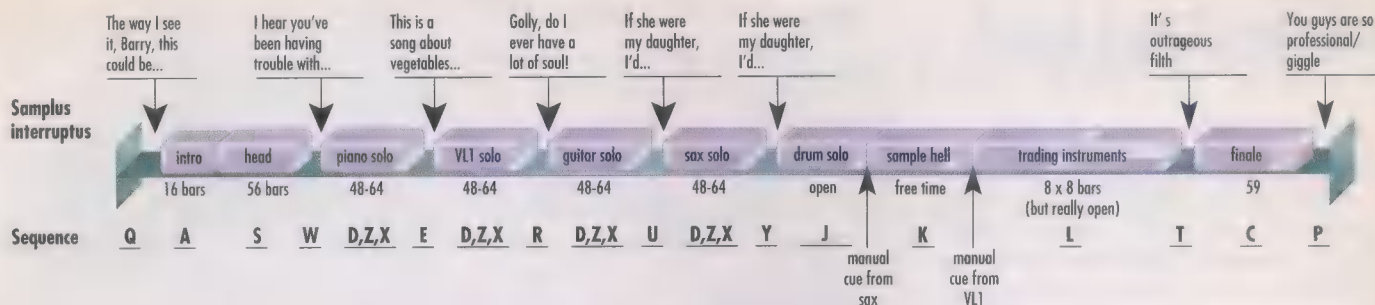


Fig. 3. Alphabet soup? No, it's the score for "King Frank," complete with samplus interruptus insert markers. Letters were used to label each of the sequences for various music/sample sections, which Todd cued from the computer during the performance.

a single 1/8 measure. So while Todd would pre-cue a sample sequence to follow the head or a solo, he wouldn't pre-cue sequences that followed the *interruptus* segments. When a musical section ended, the sequencer would play a sampled phrase by triggering a single note, then immediately stop and wait. When the sample finished, Todd would nod his head, and simultaneously hit a Macintosh key to start the next sequence, thereby cueing the downbeat for both the computer and the performers. (See Figure 3.)

One important parameter in the samplers had to be modified to make this work: The "Ignore Release" switch in the K2000 program that contained the *interruptus*

samples had to be turned on. This meant that the sample would play through to its end, regardless of when the MIDI note that had triggered it stopped.

Solo, We've Been Good to Know Ya

For our solo section, we constructed three 16-bar sequences to play underneath the solos: "start," "middle," and "tag." Each of these contained additional instrumental tracks that provided distinct accents that acted as aural references so we could hear where the computer was at in the sequence. The start and tag sequences were fixed in length, but the middle sequence was set to loop indefinitely. This allowed each solo to

be a different length. It was the soloists' job to somehow communicate with Todd using facial gestures. When a soloist felt it was time to wrap it up, Todd would cue up the tag sequence. When the currently looping middle sequence reached its end, the tag sequence would kick in. Once the tag ended, Todd would make sure another *interruptus* sequence was already cued up, so it would sound as if the music was being rudely cut off by another non sequitur.

Life in Hell

The segment of "King Frank" in which we built up to a cacophony was lovingly called Sample Hell. It included instrumental

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riffs, sung and spoken vocals, and more than a few uncategorizable noises. Sample Hell started with a short and simple sequence that sent MIDI program changes to the Kurzweils. There was a brief pause after the drums stopped (both for dramatic effect and to allow Todd to cue the next sequence), then I nodded my head for everyone to start.

We all hit the downbeat together on notes we had agreed each of us would start



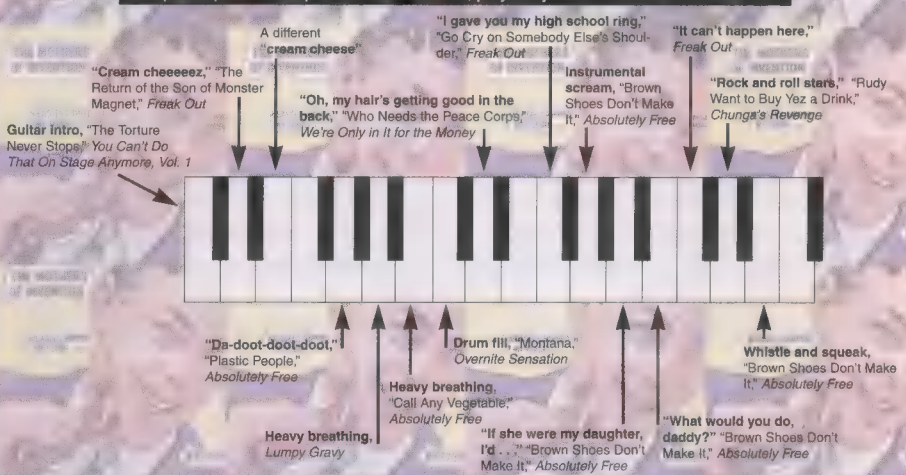
Continued from page 40

Fortunately, Berkley Integrated Audio Systems' (BIAS) Peak (reviewed in the July/Aug '97 M&C) handles that task extremely well. After recording and saving about 150 samples in Sound Designer, I brought them into Peak for some quick trimming (removing unwanted audio) and normalizing (maximizing levels), then sent them to my K2000 using SMDI — a SCSI-based file-exchange protocol used by most pro samplers.

Peak allows many functions, like transferring samples from my computer to the sampler, to be "batch-processed," meaning the same operation can be performed on multiple files (a batch) with a single command. I set up the transfer operation, typed a keystroke, then walked away for 20 minutes. When I came back, all the samples were nicely lined up inside the K2000.

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Sample map for "musique concrète" section, played by Paul's Casio DH-100 MIDI horn



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with. After that, things fell apart immediately. Everyone could play anything he wanted, and we let it evolve organically – some players would lay back for a few seconds, and then add something in response to what someone else did. Our cue to end the section was a big crescendo led by Mike pounding out, “I can’t stand it!” (from *Live at the Fillmore East*) on his Kat dk10 drum pads, faster and faster. I raised a fist in the air to cue the next *interruptus* segment, at which point Luis triggered a hideous laugh from *We’re Only in It for the Money*, followed by Claus playing, “This must be the end of the world!” from *Lumpy Gravy*.

Todd quickly started the sequencer again to begin the “trading instruments” section. For this, the sequencer only played drums and sent out program changes to all of the instruments (and turned off SampleCell by sending a value of zero for Controller #7, MIDI volume). But from the audience’s perspective, all of the sounds were wrong!

The first aural assault was a dive-bombing guitar. But one look at Brian revealed that he was doing nothing during this section: It was Mike who was triggering the sound with a stick in his right hand and sustaining it with his left elbow



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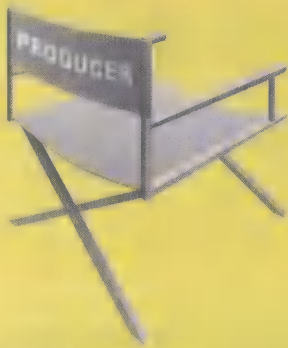
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Continued from page 42


Once the samples were inside the sampler, I created *keymaps* — assignments of specific samples to individual MIDI notes. (See page 42.) For example, the K2000 program Brian used consisted mainly of guitar loops assigned to MIDI notes that he could play with his guitar controller. Two samples were assigned to each string, and the top string got five additional samples, going up to high A.

Since SampleCell uses standard AIFF files, I was able to leave Todd's samples on the hard drive for him to arrange into keymaps with SampleCell's editing software. His set included tasty tidbits like, "Why does it hurt when I pee?" from *Joe's Garage*.

Some of you are no doubt wondering how we could blatantly sample Zappa's work without worrying about the copyright police. The answer? "Fair use" — the principle that allows anyone to use copyrighted works for certain non-profit purposes (educational use being one of the most common) without getting permission or paying royalties. 

[Ed. Note: For an in-depth discussion of samplers and sampling techniques, see our May/June '96 cover story.]

Final Thoughts

We didn't set out with "King Frank" to prove a lot of points — we just wanted to do something cool, educational, and fun. What we learned is that performing with computers doesn't have to be an either/or situation when it comes to who's in the driver's seat. With a little clever design, control can be passed from human to machine and back again without compromising your musical goals. Also, it's not necessary to re-invent the wheel, have only the very latest techno-gizmos, or be a hardcore code geek in order to do something really innovative: With the exception of BIAS Peak sample-editing software and the Yamaha VL1, all of the products we used in "King Frank" have been available for at least five years. All it takes for a project like this is a little creative thinking, and knowledge of your tools, whatever they are. 

Paul Lehrman has been using MIDI to write music for films, multimedia, and the occasional live performance since 1984. He is associate director of the Center for Recording Arts, Technology & Industry at the University of Massachusetts, Lowell, and is editor-in-chief of Signal2Noise, a non-commercial Web-based journal of research and opinion for the professional audio industry (www.s2n.org). He wishes to thank Todd Baker, Brian Calicchia, Luis Silva, Claus Trelby, and Mike Verrette, wherever they are, and Bill Carman.

on the dk10 pad. Then Luis began to flail away at his pad, but instead of drums, we heard "Pop Goes the Weasel" played on a trumpet patch. A Jethro Tull-style flute riff emerged from Claus's keyboard, followed by a plodding French horn sound, compliments of Todd's VL1 keyboard synthesizer. I chimed in on MIDI horn with a bit of the sitar riff from "Norwegian Wood." Lastly, Brian entered with a dramatic roll of cymbals and drums coming from his guitar, which had been set to trigger a General MIDI drum kit.

We went around that way twice, each of us playing about eight bars, after which Todd stopped the sequence and immediately cued another *interruptus* sample — "It's outrageous filth," as intoned by some U.S. senator in the "Porn Wars" segment from *Meets the Mothers of Prevention*. Todd then cued the band and the computer for the "finale" sequence. The sequencer restored our original programs, and we played the head again one last time. But that wasn't the end. There was one more sample to play from "Do You Like My New Car?" off of *Live at the Fillmore East*: "You guys are so professional!" blurted from the P.A. to conclude our performance. The 300-seat auditorium filled with applause, although I'm not sure it was out of appreciation or relief that we were finished.

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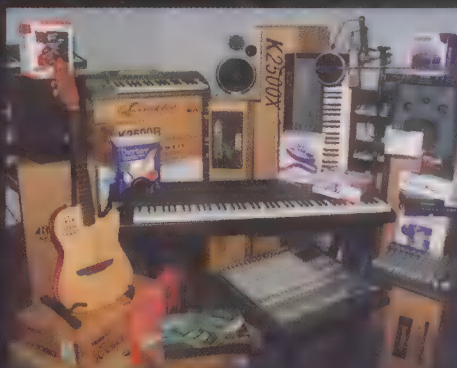
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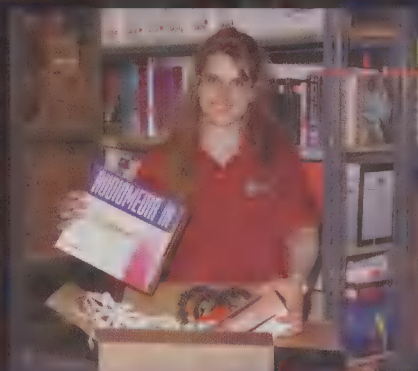
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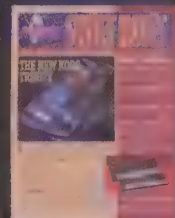
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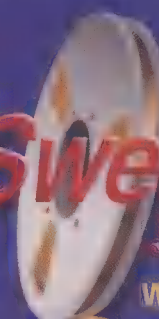
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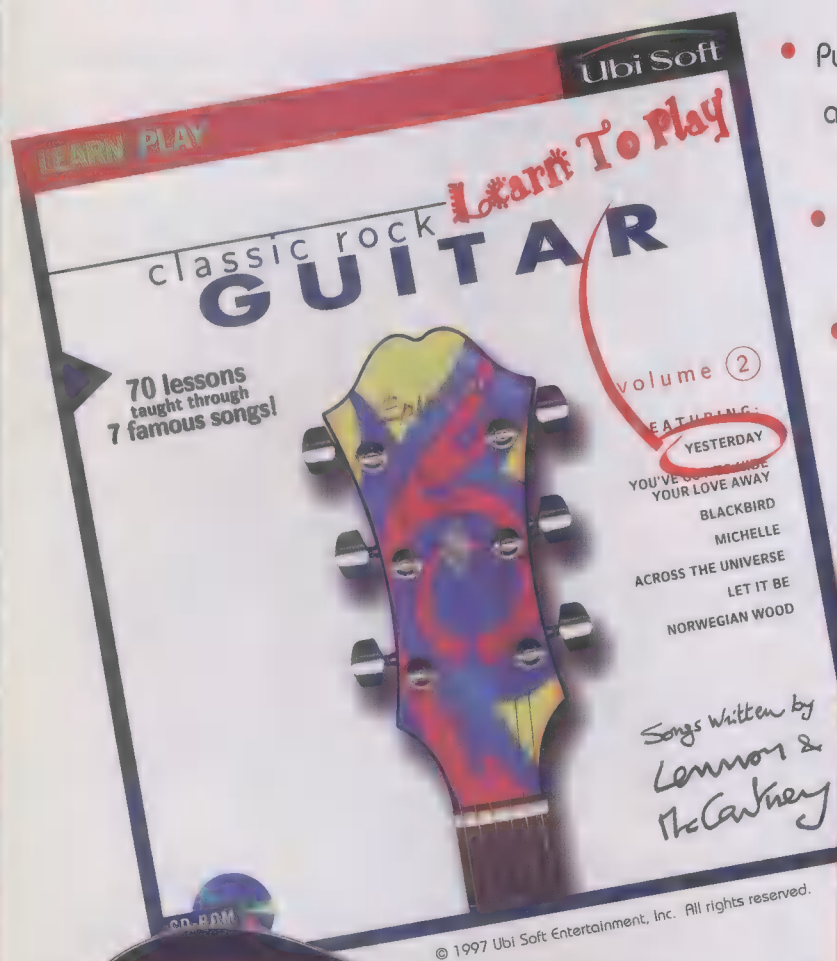
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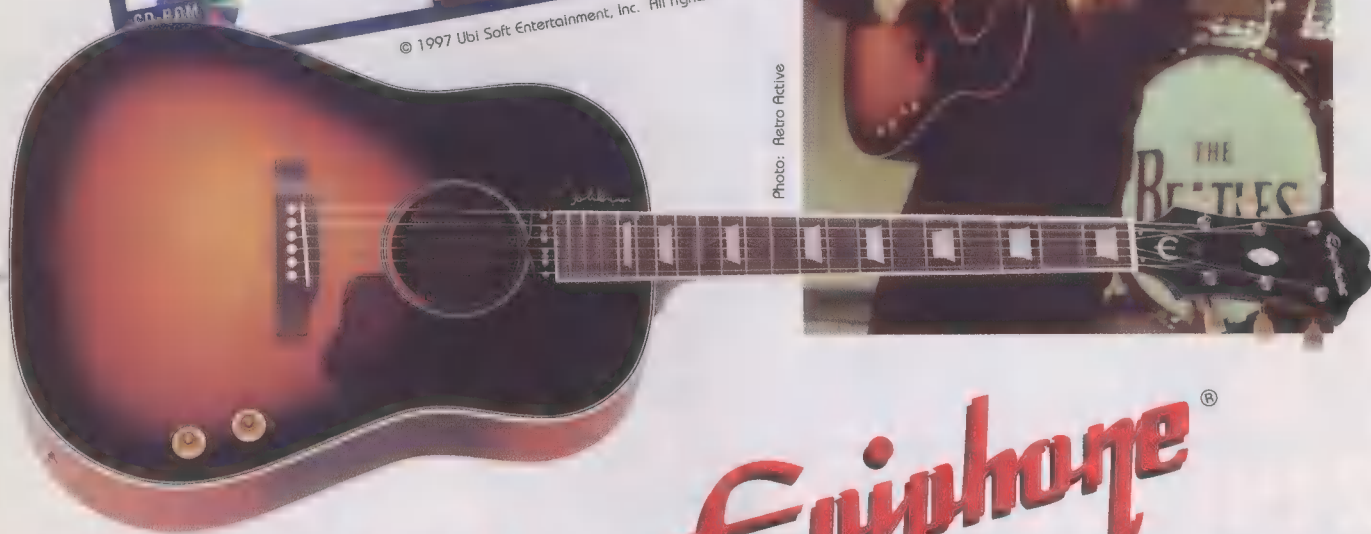
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Add Interactive Music to your Web Site with the Microsoft Interactive Music Control

The examples in this article (plus additional tips) are posted on www.music-and-computers.com so you can listen and follow along.

MORE
ON THE
WEB

Imagine that someone comes to your Web page and is greeted with a song. As they navigate your site, the music smoothly transitions

from scene to scene, much like a movie soundtrack. Every subsequent time they visit your site, they hear a similar, yet different song.

Is this science fiction? No, it exists via the Microsoft Interactive Music Control (IMC), and you can have it today. Best of all, it's free.

This article will teach you how to add interactive music to your Web site. Don't worry if you aren't an HTML power user. There are plenty of examples here (and online) to cut and paste into your existing pages.

What Is It?

What exactly is interactive music? Simply put, it's music that can respond to its changing surroundings.

When you watch a movie, the score is married to the action. Interactive music also follows the action, except the music doesn't know ahead of time what's going to happen — it changes as required to fit the scene. Even better, when you watch the same thing twice, you'll hear a familiar yet different song each time.

You might be thinking that this is an interesting theory, but nobody else is doing it on their Web page. Most Web pages,

at best, play a General MIDI file or some form of audio clip.

Unfortunately, General MIDI tunes and audio clips are very inflexible. They play the same thing every time. Audio clips have the added disadvantage that they are huge (for good-sounding ones), or crappy-sounding. [Ed. Note: With data-compression formats such as MPEG, Liquid Audio, and RealAudio, you can get good-sounding Internet audio from relatively small files, but the audio is still clip-based.]

On the other hand, the Interactive Music Control, like General MIDI songs,



By **Brian
Thomas**

Add Interactive Music to your Web Site

requires only small files. Smaller means quicker to download, and once the files are downloaded, they can make an unlimited number of songs. Also, they can sound great on every machine. (See the "Software Synthesis" sidebar on page 49.)

When creating interactive music, you can think of yourself as a conductor. You will tell the "musicians" inside the computer what type of music they should play when, but you don't actually play any of the instruments. That's right — you *don't* have to be a musician. All the music files are already made for you. Currently, tools to convert your own music into interactive music files aren't publicly available, but there are over 100 types of music to pick from.

What You Need

What do you and the visitors to your Web site need to use the IMC? A 486 (or preferably a Pentium) PC, either Windows 95 or Windows NT 4.0, any soundcard, and a live Web connection (through your modem is fine). Programming knowledge can't hurt, but it's not necessary, since plenty of cut-and-paste examples are available. The IMC also requires either Internet Explorer 3.0+ or Netscape Navigator, though you'll need to delve into JavaScript to write IMC pages for Navigator. (Details are available at www.microsoft.com/music.) In this article, we'll cover just the Explorer side. Explorer is available for free from www.microsoft.com/ie/download/.

The IMC is an ActiveX control, or *plugin*. ActiveX controls enable your browser

do things it could not ordinarily do. MacroMedia's Shockwave is another example of an ActiveX control: With it, you can run multimedia presentations and even play games over the Web.

Like other ActiveX controls, the IMC is a little program that sits in between your Web page and the browser; it intercepts all the commands that deal with interactive music. Without the IMC, these interactive music commands would mean nothing to the browser, and the browser would report an error. Don't worry, though — your Web page can easily and automatically install the IMC on a visitor's machine.

Scenario 1: A Simple Web Page

Before discussing exactly how the control works, let's create a small Web page that plays music. It's always better to hear what you'll be working with first.

Type the HTML code in Table 1 into a text document. You can use Notepad for this, or you can view this Web page on the *Music & Computers* site at www.music-and-computers.com. If you view the page from M&C's site, you can copy the example to your personal machine by selecting "Source" from Explorer's View menu and then (in the Notepad document that pops up) saving the

Fig. 1. The Interactive Music Express utility lets you quickly try out IMC's Styles, Personalities, Bands, and Motifs. You can find it at www.microsoft.com/music.

file. Whether you type in the code or you get it off the Web site, you'll need a live Net connection for this page to run properly.

The spelling and numbers are ultra-important! Take a moment to double-check your work. When you're done, save this page as "FirstIMC.htm" in your favorite directory. Now double-click on this file. You will see a gray background with no text.

If this is your first time using the IMC, it will automatically download to your computer. Click "Yes" when Explorer asks you if you want to install the IMC. It will also ask you if you want to download the Microsoft Synthesizer. If you say no, the IMC will use your MIDI sound device for playback. If you say yes, then

Table 1 — Instant Interactive Music

```
<HTML>
<BODY>
<OBJECT CLASSID="CLSID:D2377D41-E6FD-11CF-8DCB-00AA00C01802" WIDTH=0 HEIGHT=0 ID=Music
CODEBASE="http://activex.microsoft.com/controls/music/IMSTUP21.CAB#version=2,1,0,14">
</OBJECT>

<SCRIPT LANGUAGE="VBScript">
<!--
Sub Window_OnLoad
    Music.EZPlaySection "http://www.microsoft.com/music/styles/jazz.sty",
    "http://www.microsoft.com/music/styles/jazz.per"
End Sub
-->
</SCRIPT>
</BODY>
</HTML>
```


Software Synthesis Solves Sorry Sound

When you hear "MIDI," do you think "cheesy sounds"? That's understandable, since you're probably thinking of the music you hear wheezing out of most soundcards. Older soundcard synthesizers are typically based on two-operator FM, which simply cannot create realistic sounds. Even newer "wavetable" soundcards can sound wimpy if the manufacturer skimped on ROM and sound development time.

The truth is, MIDI itself is silent; it's just a set of instructions that tell a synthesizer what notes to play and how to play them. If you give your computer a good sound source, then it will sound realistic. But there's the problem — how do you ensure that visitors to your Web site will have a good MIDI sound source?

Enter *software synthesis*. This technology uses the computer's CPU to actually create wavetable sounds on the fly, and then sends these sounds to the soundcard's audio output. When you install the Interactive Music Control, you have the opportunity to download this technology for free. And it works with everyone's existing soundcard.

A big advantage of software synthesis is that you're guaranteed that the sounds you hear are *exactly* what your listeners will hear. This is because the Roland Sound Canvas GS sound set is actually downloaded to everybody's machine. Effectively, that means every IMC-capable listener who visits your Web page will have the exact same wavetable MIDI module you do.

the IMC will download the Software Synthesis engine and utilize the Roland Sound Canvas GS sound set.

Once the IMC is installed, you should hear music. (If two minutes go by in silence, click the Refresh button. Otherwise, listen closely to the music.) Every time you click the Refresh button, the IMC will actually create a similar, yet different song!

You now have your first interactive-music Web page. (It's not posted on the Web yet, of course, but you can run it from your local drive.)

By the way, some of you may notice that the music sounds familiar. It should, as the IMC technology is a new generation of the music engine from the Blue Ribbon SoundWorks that was the brains behind interactive music products including SuperJam. [Ed. Note: Shortly after we featured a SuperJam Turbo Tips article in our Summer '95 issue, Blue Ribbon was acquired by Microsoft.]

If you want to glimpse the innards of the IMC, read the next few paragraphs. If you simply want to cut and paste the

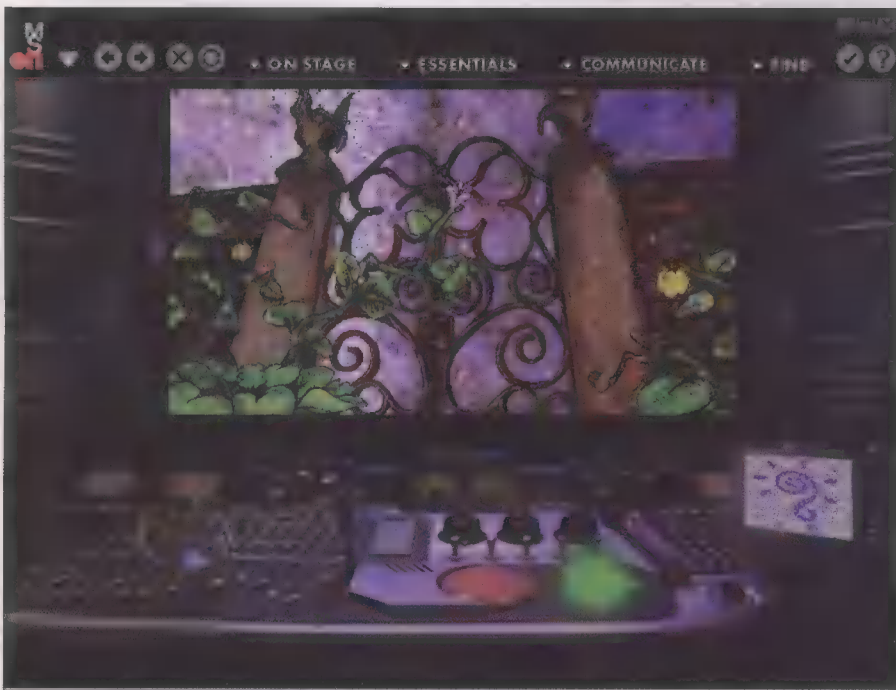


Fig. 2. In the Riff show (now appearing on Microsoft Network), clicking on different pictures on the movie screen guides the interactive music down a different path. You actually create your own music video in real time.

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Add Interactive Music to your Web Site

examples into your Web page, you can skip ahead to "Scenario 2."

Let's analyze the code in detail. Most of what you see in Table 1 is traditional HTML. All Web pages have an <HTML>

tag and a <BODY> tag. The <OBJECT> tag tells the browser that there is an ActiveX control that will be used on the Web page. The long CLASSID number is the identification tag the browser uses to determine

Table 2 — Interactive Music with Links

```
<HTML>
<BODY>
<OBJECT CLASSID="CLSID:D2377D41-E6FD-11CF-8DCF-00AA00C01802" WIDTH=0 HEIGHT=0 ID=Music
CODEBASE="http://activex.microsoft.com/controls/music/IMSTUP21.CAB#version=2,1,0,14">
</OBJECT>

<A HREF="#1" Name="1" OnMouseOver=PlayTheMotif Language="VBScript">Move the mouse over me!</A>

<HR>

<FORM Name="Buttons">

<INPUT TYPE=BUTTON VALUE="Switch Band" NAME="ChangeBand" Language="VBScript" onClick="ChangeTheBand">

<INPUT TYPE=BUTTON VALUE="Switch Style and Personality" NAME="StylePersonality" Language="VBScript"
onClick="ChangeStylePersonality">

</FORM>

<SCRIPT LANGUAGE="VBScript">
<!--
Dim gPath, gSection

Sub Window_OnLoad
    gPath = "http://www.microsoft.com/music/styles/"
    set gSection = Music.EZPlaySection (gPath + "jazz.sty", gPath + "jazz.per")
End Sub

Sub PlayTheMotif
    Dim Motif
    If gSection.IsValid then
        If gSection.Style.Name = "Jazz" then
            Set Motif = gSection.Style.Motif ("More Trumpet")
        ElseIf gSection.Style.Name = "Country" then
            Set Motif = gSection.Style.Motif ("Harmonica")
        End If
        If Motif.IsValid then Motif.Play
    End If
End Sub

Sub ChangeTheBand
    If gSection.IsValid then
        If gSection.Band.Name = "Default" then
            set gSection.Band = gSection.Style.Band ("Twangs")
        ElseIf gSection.Band.Name = "Twangs" then
            set gSection.Band = gSection.Style.Band ("Default")
        End If
    End If
End Sub

Sub ChangeStylePersonality
    If gSection.IsValid then
        If gSection.Style.Name = "Jazz" then
            set gSection = Music.EZPlaySection (gPath + "country.sty", gPath + "minaejz.per")
        ElseIf gSection.Style.Name = "Country" then
            set gSection = Music.EZPlaySection (gPath + "jazz.sty", gPath + "jazz.per")
        End If
    End If
End Sub
-->
</SCRIPT>
</BODY>
</HTML>
```

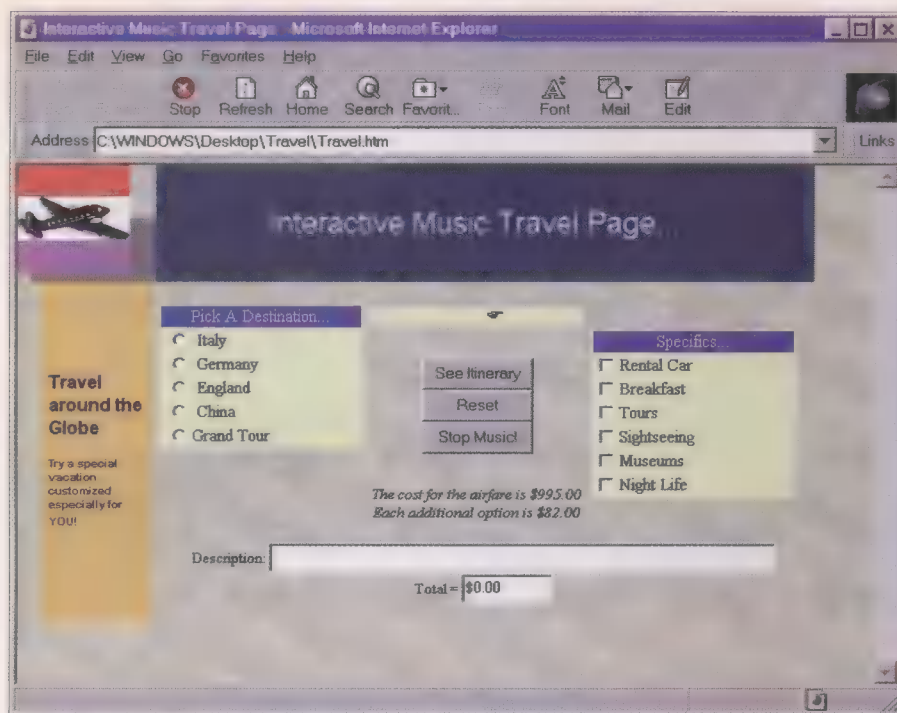



Fig. 3. As you choose different vacation destinations on this travel-oriented Web page (reproduced with commentary at www.music-and-computers.com), the music transitions appropriately between styles.

which control is being used. The CODEBASE keyword tells the browser where to go to get the ActiveX control if the computer doesn't already have it. Finally, the ID lets the browser know when other instructions in the Web page are referring to the IMC. Inside the <SCRIPT> area, you see "Sub Window_OnLoad." This subprocedure is run as soon as the Web page fully loads.

The single most important line in the entire Web page is the EZPlaySection line. This one line tells the browser that it wants the IMC to create a "Section" of music and start playing it when it's ready. It even tells the IMC where to go to get the content files for this Section.

A Peek Under the Hood

Any time you hear the IMC play music, you are hearing it play Sections. All Sections are made up of Styles, Personalities, and Bands. Let's take a look at what these components are.

The first building block of a Section is a Style. For example, when you hear the word "jazz," you can visualize a basic set of instruments, a basic feel, and the general vibe. The word "jazz" by itself does not specify specific chords, notes, or drum hits. If you were asked to play jazz with no other details given, you would choose all the specifics. With the IMC, it's the same thing — a Style only defines the general vibe.

Another fundamental is the Personality. This is the mood of the band members. It defines the types of chords used, from simple to complex, major to minor, and everything in between. If a jazz band were to switch from some really "out there" chords to simple blues chords, they would be changing their Personality.

The next building block is the Band. This is the group of instruments that the IMC musicians happen to be playing. If you were to change the Band, you would be replacing all the instruments being used by the musicians with a different set. This would not affect what notes, chords, or style of music they're playing, however.

Let's put these together. If you told a live band to play a particular Style of music, in a specific Personality, and with a specific set of instruments, they would be able to start playing music based on what you had told them. You wouldn't know exactly what they were going to play, but you would have a good idea.

This is basically how Sections are built. The IMC allows you to mix and match these three components freely, and with each combination, it's able to create a different Section of music.

Now let's explore how this works in the context of the Web. When a Web page encounters IMC commands to, for example, play a Style of music, it first checks to see if the required Style and Personality

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have already been loaded. If not, the IMC proceeds to download them. After the Style and Personality have been downloaded, the IMC can compose a Section of music. This "composition" occurs on your machine, not the Web server.

The IMC is not a *streaming* technology, so the files have to fully download before you can hear them. On the bright side, if other IMC files are already loaded, they can continue to play as the new ones download.

What Else Is Possible?

When you watch a movie, you don't hear the same song play throughout the movie, and you don't hear abrupt jumps between different songs, either. That's because the composer of the score makes sure the music flows from the beginning to the end. The music needs to flow from part to part, even if the types of music being played aren't similar. The IMC can do this. Meet *Transitions*.

IMC Treasure Trove

Want to know everything there is to know about programming the Interactive Music Control? Then point your browser to www.microsoft.com/music. This site contains the full documentation for every nook and cranny of the IMC. It even includes the Interactive Music Express utility, which lets you quickly try out all the Styles, Personalities, Bands, and Motifs. (See Figure 1 on page 48.)

Want to see interactive music in action? A growing number of people and companies are using this technology. The interactive music in the Microsoft Network's opening welcome page and in many of their Web "shows" is based on the same technology as the IMC. This includes *Riff*, which showcases interactive music with a different featured artist every week. (See Figure 2 on page 49.)

One IMC user, Australian Bernie Halpin, has written his own version of a tutorial on how to program the IMC. (See users.mcmedia.com.au/~bmhalpin/inter-music.htm.)

Finally, Bobby Prince of the *Doom* and *Duke Nukem 3D* craze has an interactive musical story on his Web site (www.bpmusic.com). [Ed. Note: For more on Bobby Prince, see our feature story on page 20.]

At any time, the IMC can transition between Section A music and Section B (which can be whatever you want). All you have to do is ask, and the IMC will compose a bridge between the two. It automatically takes care of playing an embellishment (like a fill or a break), as well as composing a chord progression that bridges the two Sections. One really cool trick the IMC can

do is perform these transitions between Web pages. That means your entire Web site, not just one Web page, can take advantage of interactive music.

When you listen to Prokofiev's *Peter and the Wolf*, you hear a little theme every time a new character is introduced. The mini-melody isn't random; it's carefully orchestrated to fit perfectly with the rest

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of the music that's playing. The IMC can do this with *Motifs*. A Motif is a musical theme that can play on top of a Section of music. The IMC automatically modulates a Motif to play in the correct key of the Section of music already playing, and it will compensate even if the chords change while the Motif is playing.

When can you play a Motif? Any time! The IMC is flexible in that it allows Motifs to be triggered whenever you want; not when it feels it's convenient.

Scenario 2: An Interactive Music Site with Links

Let's make a Web page that plays a Style (as above), but this time let's have it play a Motif when you move the mouse over a link. Also, let's add a button that changes the Band, and another one that toggles the Style and Personality between two different choices.

Refer to Table 2 on page 50. The first thing you'll notice is that much of the typing you did in the previous example appears in this example. You may want to cut and paste the first example into a new Notepad document, and edit it from there. Or, you can view this page from the M&C Web site.

Again, double-check the spelling. (Computers are so picky, aren't they?) Save this page as "IMC-2.htm." When you double-click on this file, you'll see a hyperlink and two buttons. In just a moment, you'll hear some jazz.

Every time you move your mouse over the hyperlink, you'll hear a Motif play. The code that does this is the <A HREF> code at the top of the page and the PlayTheMotif subprocedure in the middle of the script. You can put any valid Motif name in place of "More Trumpet" and "Harmonica." Where can you get this list of Motifs? On the M&C Web site.

Now, click the "Switch Band" button. Notice how the Band changes from a traditional jazz band to a twangy-sounding band. Feel free to switch it back and forth. The code that does this is the <INPUT TYPE=BUTTON> code, which points to the ChangeTheBand subprocedure. You can pick any Bands you want; they're also listed on the M&C site.

Next, click the "Switch Style and Personality" button. After about a minute, you'll notice the music does a transition

from jazz to country. Every subsequent time you click the button, it will quickly transition between jazz and country. Using the list mentioned above, pick any Style and Personality you wish.

Why did it take so long for the first transition? Because the IMC had to download the content necessary to play the country music. This all happens automatically and "under the hood." Once it's downloaded, though, the IMC can switch between the two Styles almost immediately.

Feel free to cut and paste all the code in this Web page into your Web page, and experiment away.

Scenario 3: Take a Vacation!

There is another excellent example of how to use the IMC on the M&C site. This page simulates a vacation-planning service, complete with interactive music. (See Figure 3 on page 51.)

When you enter the vacation page, you're greeted with interactive music. As you pick different countries, notice how the music transitions between the different Styles of music. Also, as you pick different special travel packs, you'll hear a Motif play.

This Web page introduces you to some other IMC features, like Callbacks, which allow the IMC to tell your Web page what it's up to. While there isn't enough space here to describe how this page works, the Web page itself is loaded with comments that explain what is going on.

Also on the M&C site is a "tips" page that will help you avoid the most common IMC mistakes, as well as make your Web pages more robust.

Summary

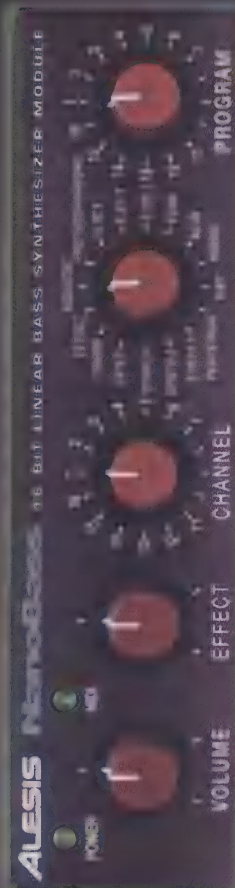
As you can see (and hear online), interactive music is a fresh new way to entertain your visitors. I hope this article has opened your eyes to the possibilities of the Microsoft Interactive Music Control. You too can musically "interactivate" your Web page, and give your visitors a pleasant musical experience that is different every time they hear it. Enjoy! ♪

When Brian Thomas isn't thinking about music technology, he . . . no, wait, he's always thinking about music technology. He's part of the DirectMusic development team at Microsoft.

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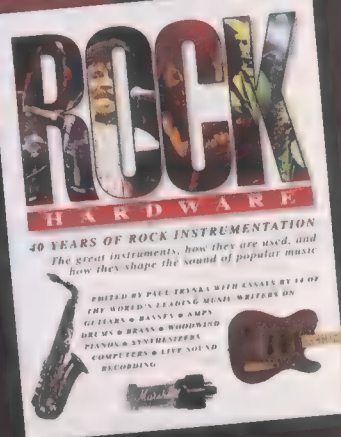
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Axon NGC 60

Guitar-to-MIDI Converter

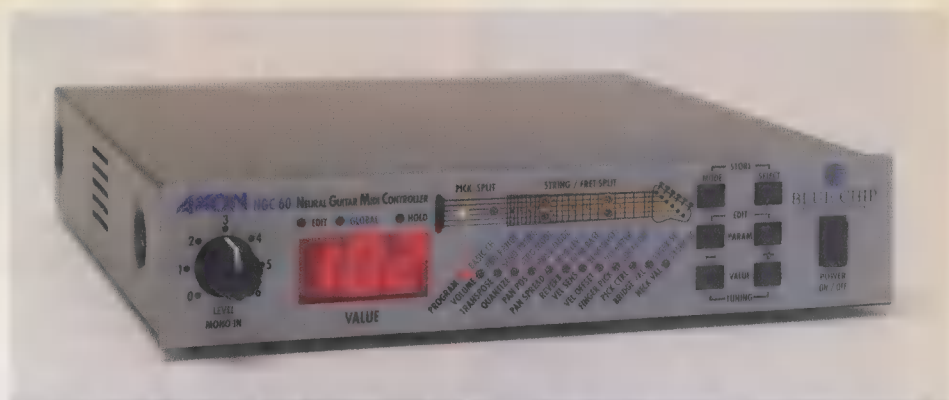
By Craig Anderton

If MIDI guitar is truly for propeller-heads, explain this: A couple of weeks ago I was at a seafood festival (don't ask, it's a South Florida thing) where an older guy was doing Jimmy Buffett-type material. Interestingly, his MIDI guitar provided all the various guitar sounds (as well as an occasional steel drum patch). I'm also seeing more cover bands and solo acts in venues such as restaurants using MIDI guitar to expand their sonic options. MIDI guitar may not be the hip thing for musos, but working stiff and desktop musicians who don't play keyboards are discovering just how cool guitar synthesizers can be.

Roland has traditionally ruled the guitar synth/MIDI guitar market, with good reason — each successive model tracks better and has increasingly “musical” onboard synthesis. Recently, though, Yamaha has challenged Roland with the G-50, a soundless guitar-to-MIDI converter, and Axon — technology partners with Yamaha — has expanded its line of converters to include optional onboard sounds.

Axon's NGC 60 is compatible with any guitar using the Roland GK-2, Yamaha G1D, or Axon AIX101 synth driver (some Fender, Godin, Ovation, and Paradis guitars have built-in drivers; Axon also makes a bass driver). The driver consists of a divided pickup (one output per string) that mounts between your guitar's bridge and treble pickup, and a small, guitar-mounted control module. You can affix these temporarily with double-sided tape; permanent installation requires two small screws for the pickup and one for the module.

The Basic Deal. The converter and soundcard fit in a half-rackspace box,



This unassuming box uses neural net technology to help you connect your guitar or bass to the world of computers and MIDI.

powered by a sizable outboard power supply (which terminates in a standard AC cord so it doesn't hog outlet space). One caution: The NGC 60's underside gets pretty warm, so leave an open rackspace below it for ventilation.

The user interface makes it fairly easy to access the unit's considerable power. Three LEDs display the selected edit mode (individual presets, global settings, or the hold switch), three seven-segment LED readouts show program numbers and messages, 13 LEDs indicate the selected editing function (for either global or preset parameters), and six LEDs graphically show various split modes on a guitar-neck diagram.

As for controls, two buttons select the parameter to be edited, two inc/dec buttons change parameter values, and two more buttons select the overall editing mode and split edit options (more on this later).

The interface isn't really usable live, but you'd probably program presets ahead of time anyway, and select them as needed from the synth driver's control module or a footswitch.

Gozintas & Gozoutas. The interface box has a connector for the cable from the divided pickup, and MIDI In/Out/Thru

jacks. Two 1/4" footswitch jacks accommodate hold and “chain” (preset advance) footswitches. There's also a bass/guitar switch, direct guitar output, and a jack for the AC adapter.

The MIDI Thru jack is unusual in that the two unused pins carry the hot leads for the soundcard's stereo outputs. Axon includes a special cable that picks off this stereo signal and sends it to two inline, female 1/4" jacks.

The Learning Curve. Here's a switch: When editing the unit's sensitivity to match your playing style, the Axon learns how you play, rather than the other way around. It decides on the best sensitivity setting for each string, sets them accordingly, and tells you when all is well. This is *extremely* cool. (Sensitivity determines the volume thresholds at which the interface detects the beginning and ending of a note.)

To set the sensitivity for loud strumming, I called up the sensitivity function and strummed. After about a minute, the box was optimized. Later, I wanted to optimize it for lead, so I played some leads. Again, after a little playing, the unit was ready to go. Unfortunately, you can't store different sensitivity settings for different playing styles (although the NGC 60's

more expensive big brother, the NGC 77, can store four different settings).

The Sounds. An optional XG/GM-compatible wavetable daughterboard, Yamaha's DB50XG, provides the onboard sounds. [Ed. Note: We reviewed the DB50XG in our Sept/Oct '96 issue. GM stands for General MIDI, a system that specifies the 128 sounds that a GM-compatible synthesizer must

have, as well as their memory locations. XG is an extension of GM. Among other things, It specifies more sounds and control parameters.] The DB50 also serves as a general-purpose GM/XG module, which is certainly welcome. Curiously, though, enabling local mode (in which the guitar drives the soundcard) limits access to just the board's 128 GM voices; with local mode off, you can access the full XG range of voices and drum

kits via Bank Select and Program Change messages sent to the Axon's MIDI In.

You can access these sounds with guitar, but the process is convoluted at best. Since local control has to be off, you'll need an external sequencer that can send the desired bank and program changes to the Axon, as well as provide a "MIDI Thru" function for each string *over its own channel*. This is not a common feature, but an even more annoying problem is that if you finally do manage to access the XG sounds with the guitar, you can't save this as a preset. It would have been better if, when selecting programs to go along with specific presets, you could specify banks as well as programs in order to make full use of the board's XG talents.

These idiosyncrasies aside, the DB50XG's sounds range from cheap to exceptionally good, with most somewhere in between. The board doesn't really stack up against a multi-thousand dollar synth, but given the price point, it is unquestionably light years ahead of the original Sound Blaster-type cards. (The Axon also accepts other Wave Blaster-compatible daughterboards, such as the Roland SCD-15.)

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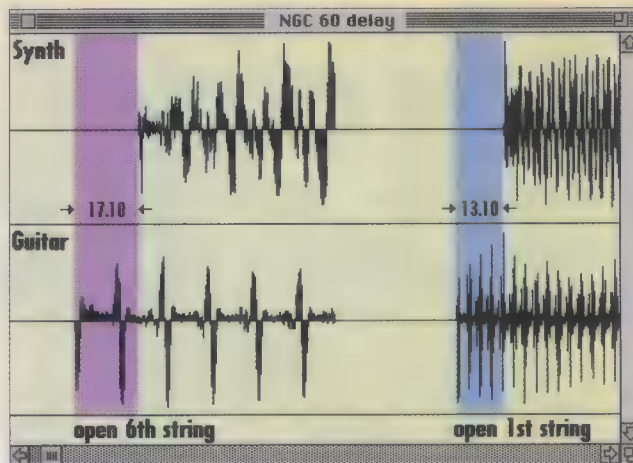


Fig. 1. When you play a note on the guitar, the Axon NGC 60 determines the pitch and triggers a note on a synthesizer. This screenshot of a test recording (made in Digidesign Sound Designer II) shows the delay between the time the first and sixth open strings were played and the time that sound was produced by the Axon's internal tone generator (13.10ms for the high string and 17.10ms for the low). Low notes take longer to analyze because their wavelength is longer.

DESCRIPTION

Guitar-to-MIDI converter with socket for adding soundcard daughterboard.

REQUIREMENTS

Roland GK-2, Yamaha G1D, Axon AIX101, or equivalent divided pickup for electric guitar, acoustic guitar, or electric bass.

SUGGESTED RETAIL PRICES

\$895 for basic NGC 60, \$1,095 with Yamaha DB50XG daughterboard (NGC 60SB). AIX101 synth driver pickup, \$249.

CONTACT

Dist. in the U.S. by Music Industries, 99 Tulip Ave., New Hyde Park, NY 11001. 516-352-4110; fax: 516-352-0754; Axon Web: tarkus.pha.jhu.edu/~andras/axon.html. Circle #160 on reader service card.

PROS

Fast, accurate response. Expressive pick-position modulation. Fret and string split options. Adapts sensitivity to your playing style. Compact. Usable with optional internal sound board or external synth modules. Doubles as General MIDI/XG sound module. Audio input for converting mono sound sources to MIDI.

CONS

Exploits the sound board's full power only via MIDI In, not with guitar. Manual needs a major overhaul. Can't assign a different sound to each string, only to two groups of strings. Programming can involve lots of button-pushing.

BOTTOM LINE

The Axon's main strength is excellent MIDI conversion, with accurate response and fast tracking. The optional internal soundcard is convenient and cost-effective.

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47JS6-MC, if you're driving external modules, is a different story. The Axon's

tracking and speed are about as good as it gets given the laws of physics, pitch-bend tracking is very accurate (and the data thinning algorithm is well implemented), and the split options are great — in particular, pick-position modulation is an outstanding extra. The Yamaha G50 (which is based on Axon's technology) is probably the best choice if all you want is MIDI conversion, since it costs a bit less. But it doesn't have the option to add an internal soundcard, so you have to factor a tone module into the price.

If you want an easy entry into MIDI guitar, one that adds decent onboard sounds to excellent conversion accuracy, try the NGC 60 with a DB50XG — it fills a unique slot in the world of guitar synthesis. ◀

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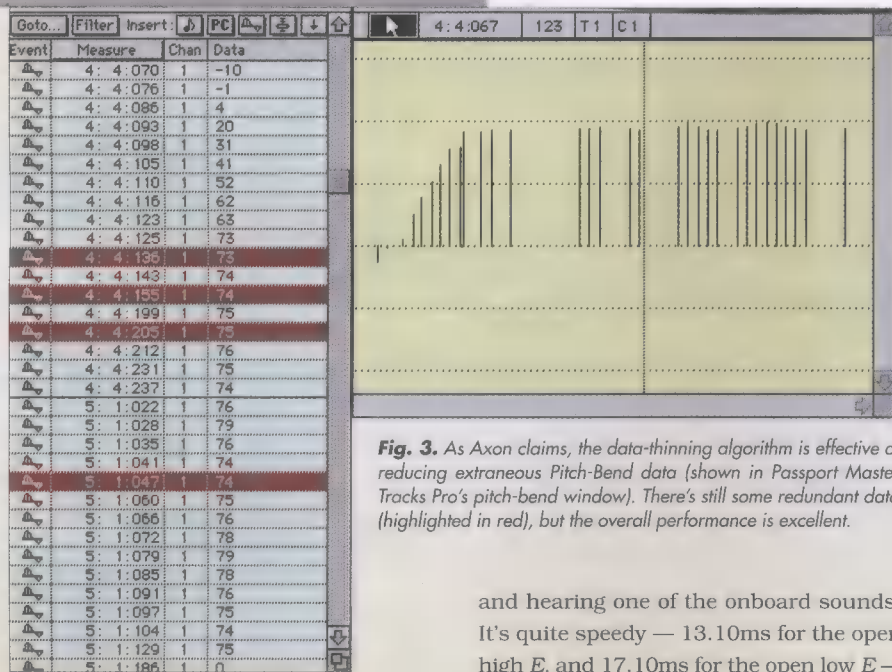


Fig. 3. As Axon claims, the data-thinning algorithm is effective at reducing extraneous Pitch-Bend data (shown in Passport Master Tracks Pro's pitch-bend window). There's still some redundant data (highlighted in red), but the overall performance is excellent.

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As for accuracy, Figure 2 shows a strummed guitar part (one of the nastiest things to do to MIDI guitar). Note the paucity of glitches; this is a pretty clean device. Finally, Figure 3 shows the Pitch-Bend message density, which as Axon claims, is thinned considerably to avoid data clog.

Back to Mono. As the *coup de grâce*, an audio input and associated level control accepts any line-level mono sound source. Voice- or flute-to-MIDI, anyone? You

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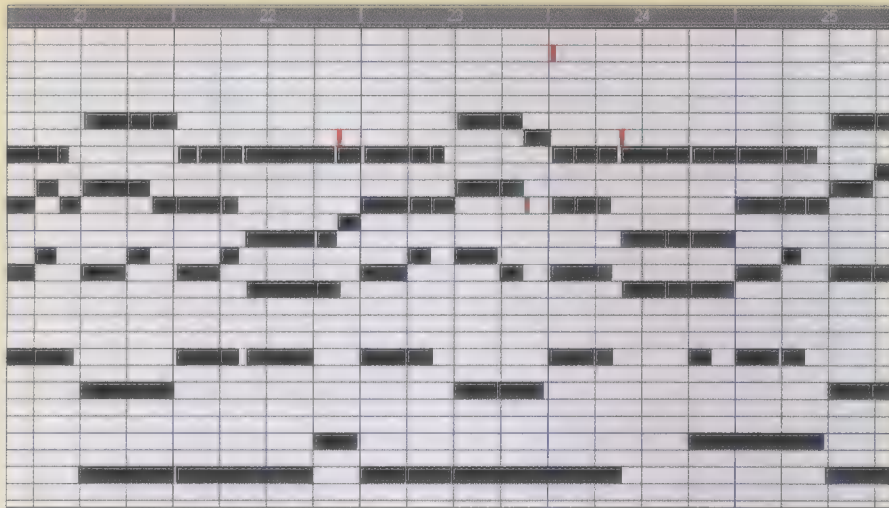


Fig. 2. This screenshot from Cakewalk Pro Audio shows the MIDI notes in an unquantized rhythm guitar part. Although this type of part really pushes guitar-to-MIDI converters to the limit, there were only four small glitches (indicated in red).

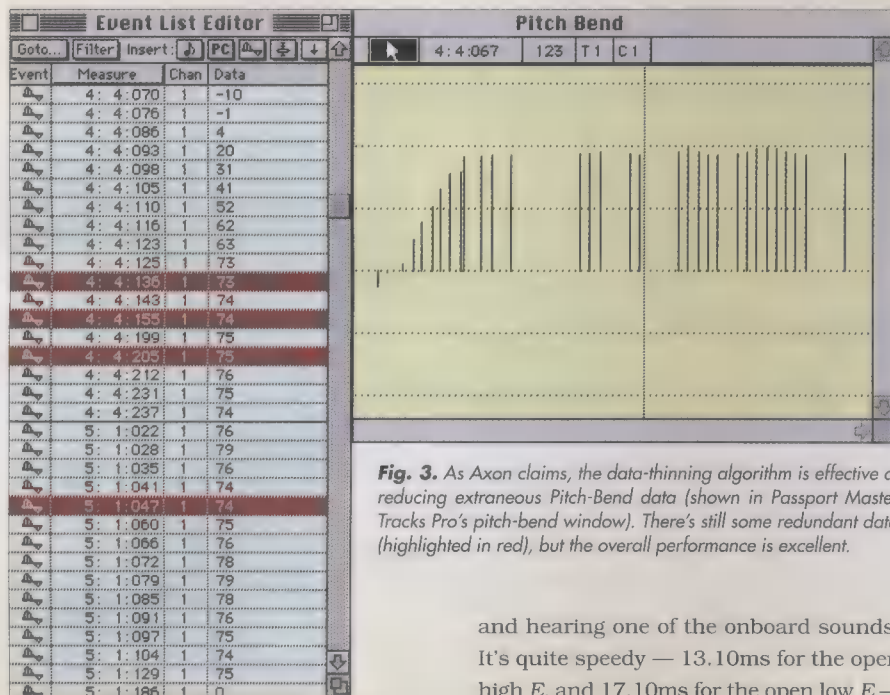


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Conclusions. The big question on most people's minds will be Axon vs. Roland GR-30 vs. Yamaha G50. The answer depends on your application. If onboard sounds are a priority, I'd take the GR-30's internal sounds over the DB50XG board. Roland has tweaked their tone generator to work specifically with MIDI guitar, whereas the DB50XG is more of a general-purpose computer card. Although the GR-30 doesn't have an audio-to-MIDI feature, it offers some cool goodies (such as arpeggiation and harmonization), has footswitches built in, and costs \$200 less.

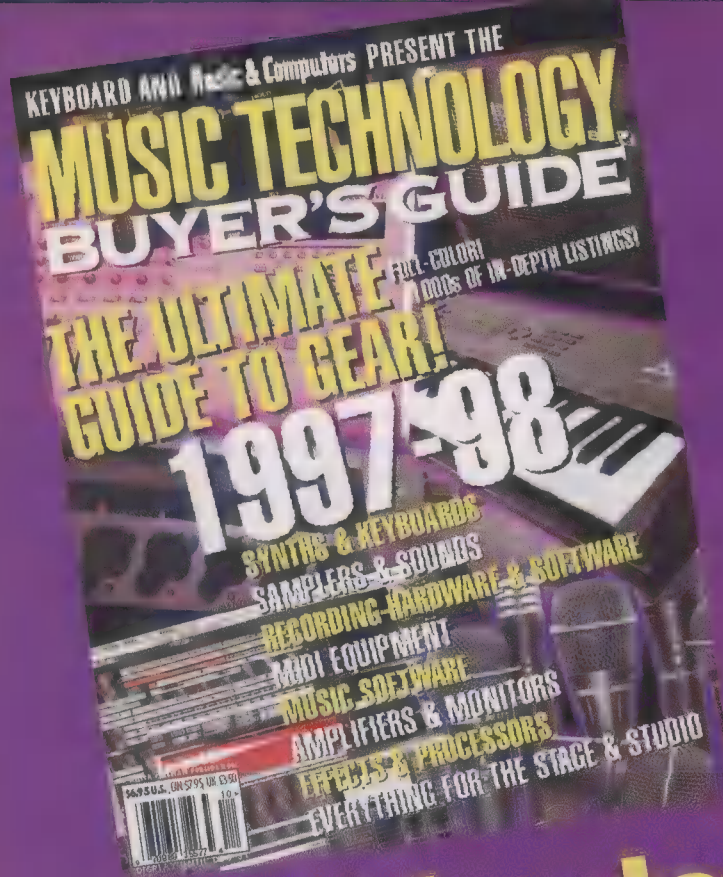
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By Geoff Goacher

Fig. 7. Dave Gehlhar's Selah Studio in Alamitos, California. You might not have a rare pair of Manley ML10 speakers or a 24-channel Soundcraft console, but your equipment should be set up using some principles.

SPEAKERS

Have you ever taken a great-sounding mix from your home studio and played it on your car stereo, only to find that it sounded terrible? Or have you played a favorite CD through your studio speakers and noticed that it somehow sounded wrong? These are telltale signs of a poor monitoring system. A poor monitoring system will keep you from achieving the full potential of a desktop music setup. With a good system, you'll be a lot closer to consistently turning out great mixes.

This article will walk you through the process of setting up an effective monitoring system — specifically, a “direct-field” system, in which the speakers are about three to five feet from your ears. Monitoring in the near field, you can minimize the sonic effects of the room you're

listening in, although I'll also explain how you can improve your room's acoustics. Let's begin.

THE EQUIPMENT

First of all, unlike your living-room stereo, the goal of a studio monitoring system is not necessarily to sound “good.” The goal of a monitoring system is to sound *accurate*. Accuracy depends on both the audio components and the listening environment.

The process starts with using good equipment and correct placement of the equipment within the room. This means using studio-grade speakers and amplifiers, not the dinky “multimedia” speakers that came bundled with your computer. Most multimedia speakers are simply too small to reproduce a wide enough range of the frequency

spectrum. (However, they are not totally unusable, as I'll explain later.)

Monitor speakers should have a *frequency response* that is both *wide* (at least 60Hz to 20kHz) and *flat* (no more than ± 3 dB deviation from the original signal). A wide frequency response lets you hear what really exists in your music. For instance, let's say that a recording of yours had some really nasty 60Hz hum in it, but your speakers only reproduced sound down to 100Hz. While mixing over your speakers, you probably wouldn't even hear the hum (though you would hear its harmonics at 120Hz and up). However, when audiophiles bought your CD, they would be awfully annoyed by the hum that was so enormously audible on their full-spectrum stereo systems.

The reason for using speakers with a flat frequency response is so you can hear the true tonal composition of your music. While many speakers are labeled as having 20Hz-20kHz frequency response, that spec says nothing about their accuracy at each frequency, which is what the " $\pm X$ dB" figure reveals. With a low X value, a graph of the speaker's output will resemble a flat line, meaning that any frequency you send into it comes out at nearly the same level. As the X value increases, the graph starts to look more like a roller coaster, because the speaker has emphasized some frequencies while diminishing others.

If you mix on speakers that don't have a flat frequency response, you'll almost certainly overcompensate by applying gobs of EQ, ending up with a mix that only sounds good on that set of speakers.

There are several near-field monitors on the market that meet the above frequency-response requirements for a pretty good price. Some popular models include the Alexis Monitor Ones, Event 20/20s, JBL 4206s, KRK K-Roks, Tannoy PBM 6.5s, and Yamaha NS10Ms. Ready for a shocker? Even though they're all within the limits of accuracy we established, they all sound different. At this point, aesthetics come into play. The key to selecting the right monitor for your tastes is to go to a pro audio dealer and compare them against one another. (See "How To Choose Studio Monitors" at right for detailed guidelines.)

HOW TO CHOOSE STUDIO MONITORS

Selecting the right pair of studio monitors is not as simple as picking up any set of speakers reported to have a flat, full-range frequency response. To ensure that you're getting the speakers that best fit your tastes and the type of music you mix, you must take a trip to your local pro-audio store and conduct a thorough listening test of the various models within your price range. Here are a few guidelines to help you through the process.

First, let a salesperson know that you want to buy a pair of studio monitors and have him or her show you what's available in your price range. Ask the salesperson to set up these monitors for A/B listening comparisons (don't be shy). If the salesperson says no, or is truly unhelpful, then you're in the wrong place. The best dealerships are happy to help you through this process, because they know you're smart for wanting to listen before you buy.

Use a few CDs to test the performance of the speakers. The CDs should be impeccably engineered recordings similar to the type of music that you mix, and you should be intimately familiar with them. (See the "Reference CDs" sidebar on page 63 for a few suggestions.)

I've found that Seal's "Kiss from a Rose" is good for conducting pop-music speaker evaluations. There's nothing magic about this particular song, but most of us are familiar with it. We have heard it on car stereos, home stereos, grocery store P.A.'s, in movie theaters, etc. It's a hi-fi recording with lots of low-end punch, intricate midrange details, shimmering high end, and tremendous stereo imaging. I've noticed that bad speakers don't reproduce this song very well, and it can therefore be used as a pretty good gauge of a speaker's limitations.

Using this song as an example, a typical listening test would be conducted as follows:

1. Sit in the "sweet spot" between the speakers, and compare only two sets of speakers at a time. Make sure that you can easily switch back and forth between them. The speakers should be set up similarly and should be played at equal volumes (studies have found that we usually judge even slightly louder speakers as sounding better). Since two sets of speakers can't occupy the same space, place one set of speakers on top of the other with your ears level with the point where the speakers meet. That way the components will be equidistant and the imaging won't change when you switch.
2. With the song playing, do you notice that one set of speakers articulates the bass and kick drum better than the other? Does one set provide more deep low end? (The section of the song between 0:25 and 0:50 is especially good for this test, since there's a lot going on in the 80-125Hz range there. Speakers with inadequate low end don't fully reproduce the bass and kick in this section; speakers with poor low end reproduce it in a mushy, undefined way.)
3. Does one set of speakers reveal more of the intricate midrange details such as the strummed acoustic guitar? Do more instruments jump out of the mix during the choruses? Does one set reveal more of the graininess of Seal's voice? These details are primarily within the 500Hz-5kHz range. A speaker with good midrange will reveal these details almost microscopically.
4. Does either set of speakers more clearly reveal the opening and closing of the hi-hat throughout the song? Does either reveal more of a "click" on the kick drum beats? Both of these sounds occur within the 7kHz-12kHz range. Good speakers should reproduce them.
- Does either set of speakers sound less harsh and easier to listen to? This is important, because you may wind up listening to these speakers for hours on end.
- Notice how far you can move above, below, and to the left and right of the speakers before you notice a drop in the high end. This is a good way to judge how wide the dispersion of the speaker is. You want one with as wide a sweet spot as possible.

Repeat this test for each pair of speakers and eliminate the worst-sounding ones. In the end, you'll narrow down your options to one or two models with superior performance. You might even try renting these speakers from the store so you can test them out in your home prior to committing to them.

This might seem like a rather painstaking process just for picking out a pair of speakers. However, you will reap the benefits when you see how much easier it is to consistently turn out great-sounding mixes when you've got the right studio monitors.

GET AMPED

The amplification of your speakers is also critically important. You should use a studio-grade power amplifier capable of driving your speakers at sufficient volumes. Studio amplifiers typically have a signal-to-noise ratio of at least 100 decibels (meaning hiss won't intrude on your music), a very flat frequency response (e.g., ± 1 dB) and a total harmonic distortion rating below 0.03%. These characteristics allow the amplifier to amplify sound without significantly coloring it.

Another important spec is *amplifier power*, which is expressed in watts. Contrary to what you might think, it's more dangerous to have an amp with too little power than too much. If an amp runs out of power when faced with extreme low frequencies or sharp transients, it can clip the signal. Clipping is a particularly nasty form of distortion that can damage speakers. [Ed. Note: In their electronic newsletter InSync, pro audio dealer Sweetwater Sound recently recommended using an amplifier with twice as much power as the speaker is rated for. For example, if a speaker is rated at 200 watts, they would specify a 400-watt amp. InSync, by the way, sports a

good collection of useful tips among the daily specials. Visit www.sweetwater.com/insync/ to get on the mailing list.]

Also be sure to note the speakers' impedance value, and ensure that the amp is rated for it. Many studio monitors have

4-ohm impedance, while most consumer amps are only rated down to 8 ohms. This mismatch can cause the amp to overheat.

Fortunately, many of today's studio monitors come equipped with internal amplification. This resolves the issue of having to buy a

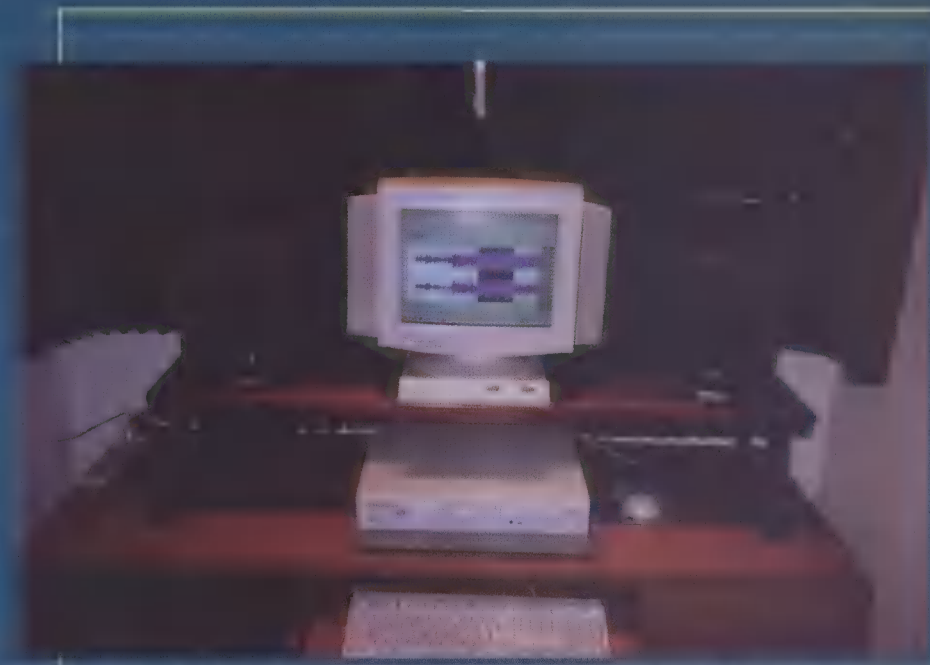


Fig. 2 A more modest desktop music setup. The speakers should form an equilateral triangle with your head and the tweeters should be at ear level.

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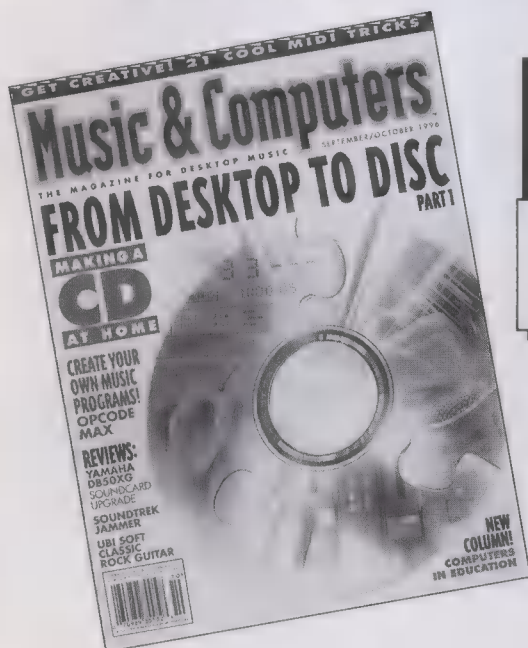
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STUDIO SPEAKERS

separate amplifier to power your speakers. Moreover, the amps in these *powered* monitors are specifically matched for their acoustic performance. Some of the good powered monitors on the market include Event Electronics 20/20bas's, Genelec's 1030As, JBL's 4208s, and Mackie's HR824s.

MORE DETAILS

Earlier I mentioned that even lowly multimedia speakers can have their uses. It's always a good idea to check your mixes

on a variety of speaker systems, especially those that are similar to speakers on which your music will be played the most. If your music is going to be played solely in games and desktop presentations, then you should definitely check your mixes on a typical multimedia system. This will tell you if any critical elements of your mix are going to drop out simply because of the limited frequency response of those speakers.

Don't forget to hook up your system with decent cables. Years ago, I was surprised at the difference I made when I switched all my 16-gauge cables to 12-gauge ones. (Lower gauges mean thicker wires.) Although the effect of cable size on audio

is hotly debated, I could really hear a noticeable improvement in the quality of the low bass and harmonics of the sound.

THE LAYOUT

Now that you have a great set of monitors and an amp to drive them, it's time to put them in your studio. The placement of your monitors in the room has a critical effect on how accurately you are able to hear them. For this discussion, I'll assume that your room is either square or rectangular. Rectangular rooms work particularly well, as I'll explain.

"Flat" is the buzzword of good monitoring equipment, then "symmetry" is the buzzword of its placement within the room. Here are a few principles to ensure symmetry in your speaker setups: First, if you have a rectangular room, then your speakers should usually be set up nearest one of the shorter walls. This helps to delay some of the first-order reflections (echoes from the back wall) as long as possible.

Second, the speakers should form an equilateral triangle with your head. This means that the distance between the speakers should be the same as the distance from each speaker to your ears. (For direct-field monitoring, this is generally three to five feet apart.) The speakers should be angled inward so that the tweeters point directly at your ears. This equilateral triangle will form your mixing position. (See Figures 1-3.)

The corner of the triangle where your head is located should be equidistant from the side walls of the room. I usually recommend that it also be set back from the front wall by roughly one-third the length of the room. (You should have about two-thirds of the room behind your head.) This should result in a pleasantly balanced sound.

Note, however, that you shouldn't set up your speakers too close to any wall or corner. Placing speakers within a foot of a wall can increase bass frequencies by as much as 6dB. Within a foot of a corner, that can jump to 9dB.

Also, you want to *decouple* the speakers from the room as much as possible. This prevents the sound waves from simultaneously traveling through the air and other room objects (floors, desks, etc.), causing frequency aberrations. Many commercially available monitor stands are designed for this purpose. Another easy way to decouple speakers is to set your monitors on top of 1/2- or 3/4-inch open-cell



Fig. 1 This room layout provides symmetrical positioning of the speakers and listener, minimized early reflections at the mix position, and diffusion of the later reflections.

REFERENCE CDs

Compact discs can be very useful for sound system troubleshooting. Probably the two best reference CDs I've come across are the *Prosonus Studio Reference Disc*, sold by Markertek (www.markertek.com) and *Sound Check*, sold by Mobile Fidelity Sound Lab (www.mofi.com). They contain all sorts of test tones for checking potential problems such as resonances, poor phasing, left-right speaker balance, and frequency response.

It's also important to test your system by playing high-fidelity music CDs that are similar to the types of music you work with. Play these through your system repeatedly so you can get a feel for how a good recording should sound through your monitors. —GG

[Ed. Note: Independent audio consultant Joey Wolpert recommends "Chuck E's in Love" from Rickia Lee Jones's first album. "It's a little dated, but it's also one of the finest organic pop recordings I've ever heard," he says. "That song will make a speaker really jump to attention with the right amplifier. Toto's 'Rosanna' is a very good pop mix too. The criterion I use is simply that it must sound better as the system gets better."] *Frankie*

Below are some CDs recommended by composer and audiophile Gregg Moore. Stop by www.music-and-computers.com for more of Gregg's listening tips.

- Paula Abdul — *Forever Your Girl* (tracks 1 and 2 have nice tight productions).
- Fourplay — *Fourplay* (the definition of smooth clarity).
- Michael Jackson — *Dangerous* (tightness and stereo — tracks 1, 2, 14).
- Erich Kunzel — *Time Warp* (track 1, wide-response music).
- Prokofiev — *The Two Violin Concertos* (Itzhak Perlman).
- Lee Ritenour — *Color Rit* (clarity).
- Tomita — *Firebird* (a study in contrast — an imaging and mixing classic).
- Steve Vai — *Passion and Warfare* (track 2 could cause speaker meltdown).
- John Williams — *Jurassic Park* (the intro bass is larger than life).

neoprene mouse pads.

Now it's time to evaluate the sound of the monitoring system. Play your favorite-sounding CDs through it. How do they sound? Can you hear all of the instruments well, or do some stand out? Does the bass sound well articulated or is it mushy? Is there enough high end, or is there too much? Is the sound blurry? Can you distinctly hear the right speaker from the left? Are there any rattles,

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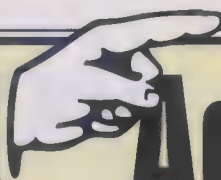
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STUDIO SPEAKERS

buzzes, or hums?

These questions will help you figure out if you need to go on to the next phases in establishing a good listening environment. Chances are, a little tweak here and there will be necessary.

FIXING ACOUSTICAL PROBLEMS

Even if you put a perfect array of monitoring equipment in a room, the room will inevitably affect its sound. This effect will either be good, bad, or some combination of the two; this is the subject of studio acoustics. Since this subject can get severely complicated, I'm going to boil it down to its three most important elements: *early reflections*, *room resonances*, and *diffusion* — the later

SMAART, SPECTRA PLUS AND MAC SLM

Smaart and Spectra Plus are sound system equalization programs for Windows 3.1 and 95. Both programs work with any Windows-compatible soundcard and a test microphone.

Smaart (\$695) features FFT-based 1-, 1/3-, and 1/6-octave realtime analyzers for measuring the frequency response of your system. It also offers a *transfer function* that allows you to test the system's frequency response using any test source — even music. Contact: SIA Software, 31 Union Square W., 13th Fl., New York, NY 10003-3203; 212-691-3880; fax: 212-691-4690; e-mail: siasoft@aol.com; Web: www.siasoft.com.

Spectra Plus (\$299) also provides an FFT-based 1- and 1/3-octave real-time analyzer and a transfer function for measuring frequency response. (See Figure 6.) Additionally, Spectra Plus can measure your components' signal-to-noise ratios and total harmonic distortion. Contact: Pioneer Hill Software, 24460 Mason Rd. NW, Poulsbo, WA 98370; 360-697-3472; fax: 360-697-7717; e-mail: pioneer@telebyte.com; Web: www.telebyte.com/pioneer.

Mac SLM (\$79) is a realtime analyzer for Mac users. It contains a sound level meter and 1/3-, 1/6-, and 1/2-octave realtime analyzers. Contact: Old Colony Sound Lab, P.O. Box 243, Peterborough, NH 03458; 603-924-6526; fax: 603-924-9467; e-mail: audiotech@top.monad.net; Web: www.audioexpress.com.

All three programs are straightforward and easy to use, even if you don't have a background in electro-acoustical measurements. They're definitely worth checking out if you're planning on really fine-tuning your system. (Demo versions are available.)

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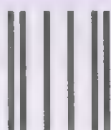
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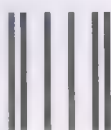
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ETF ACOUSTIC MEASUREMENT SOFTWARE

ETF (\$129) is an acoustics analysis program that operates under Windows 95. It works with any microphone and Windows-compatible 16-bit soundcard to measure the level of early reflections and room resonances, and the diffusion of later reflections.

To use ETF, you place a microphone at the mix position (*i.e.*, where your head would normally be), then play a supplied test CD through your monitoring system and record it as a .WAV file. The program analyzes the sound file and generates enlightening diagrams to help you visualize the acoustics of your room. (See Figures 4 and 5 on pages 66 and 67.)

ETF is an affordable, easy-to-use program for anyone who is troubleshooting the acoustics of a room. Registered owners receive invaluable technical support in acoustics from ETF's helpful staff. Demos are available. Contact: ETF, 53 Stevenson Rd. N., Oshawa, Ontario, Canada, L1J 5M4; 800-301-1423; fax: 905-721-7540; e-mail: etf@osha.igs.net; Web: www.speedline.ca/ETF/home.shtml.

reflections. These three elements can make or break a critical listening environment.

Early reflections are those echoes that reach the listener's ears within approximately the first 20 milliseconds following the direct sound from the speakers. Since they occur so soon after the direct sound, they are often perceived as being part of it. If the early reflections are too loud, they can cause phase cancellations in the direct sound, adversely affecting its tone quality. Early reflections also tend to blur the stereo image of the left

and right speakers. Obviously, you want to keep these under control.

If you notice that left and right stereo imaging seems blurry and undefined, a good way to tighten it up is to add absorbing materials (acoustical foams, wall panels, etc.) to the walls near the speakers, as well as directly above the mixing position. Probably the best way to know where to place these absorbing materials is to use the *mirror trick*. To do this, sit in the mixing position and have a second person move a mirror along

the walls and ceiling around and behind the speakers. Turn your head along a 180° arc to the left and right. Anywhere you can see the front of the speakers in the mirror is a good place for absorption. This should cause a noticeable improvement to the direct sound as well as to the stereo imaging without deadening the later reflections because of too much absorption.

Resonances are present in every room. They are caused by the room's natural *standing waves* (new waves created by the interference of two or more waves). Although standing waves are found throughout the frequency spectrum, they are only potentially problematic from roughly 20Hz to 400Hz. They are less problematic in rectangular rooms than square ones because they are usually more evenly spread out in rectangular rooms.

When these resonances "pile up," they cause specific frequencies to take much longer to decay than others. The result is a very unbalanced bass response in the room. Certain frequencies sound extremely boomy. One affordable way to find out exactly which frequencies are affected and how much is with software like ETF.

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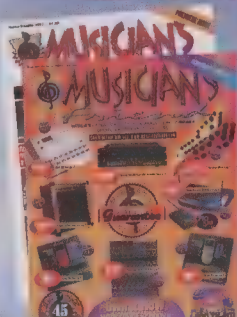
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which stands for Energy/Time/Frequency. (See the "ETF Acoustic Measurement Software" sidebar on page 65.)

It's usually obvious if you have a problem with resonances. You'll be playing a bass or piano (or whatever) in your studio and when you hit a particular note, the room will suddenly feel like it's going to rattle apart. These large resonances can be dealt with by installing *bass traps* in the studio to soak up low-frequency energy. Acoustical companies can design resonators to soak up specific problem frequencies, and ETF now includes a handy design program to help you build your own traps, though putting an extra couch in your studio can also help.

Diffusion is the last of the critical small-room acoustical parameters. Mid- and high-frequency diffusion is a description of how sounds spread out after they reflect from a surface. Walls that are flat cause sounds to reflect back at a single angle. This leads to a poorly distributed reflection, which often sounds harsh and fluttery. Diffuse surfaces, on the other hand, cause sounds to reflect at many different angles. This leads to a smooth, even decay of sound within the room.

While sitting in the mix position, have a friend clap his or her hands in front of each speaker. Do you hear any ringing "flutter echoes" at the mix position? If so, this is a

The following companies offer a wide range of materials helpful for optimizing the acoustics of your studio.

Acoustic Sciences, 855 W. First St., P.O. Box 1189, Eugene, OR 97440; 800-272-8823 or 541-343-9727; fax: 541-343-9245; e-mail: studio@tubetrap.com; Web: www.tubetrap.com. Circle #174 on reader service card.

Acoustical Solutions, 3603 Mayland Ct., Richmond, VA 23233; 800-782-5742 or 804-346-8350; fax: 804-346-8808; e-mail: acoustic@richmond.infi.net; Web: www.acousticalsolutions.com. Circle #175 on reader service card.

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sign of poorly decaying room reverb caused by flat, parallel walls. This can usually be corrected by adding commercially available mid/high-frequency diffusors to the offending surfaces at the rear and side walls of the room.

Diffusion is often the icing on the cake for studio acoustics. It's a luxury that many project studios have to live without, but it is a great investment if you can afford it. Check out the "Acoustical Materials Sources" sidebar above for information on solutions for all of these types of acoustical problems.

(See Figure 4 on page 62 for a typical layout.)

EQUALIZATION

At this point, you should have a monitoring system that's extremely reliable in its accuracy and sonic intelligibility. If you haven't yet reached that point, you might try inserting a graphic equalizer between the mixer's output and the amplifier's input. This won't do anything to solve problems with early reflections, resonances, or a poorly diffused sound, but it can usually help if your system's frequency response is slightly off balance.

However, remember that the goal of equalizing your system is not to make a sound good. The goal is to flatten its frequency response. This is most easily accomplished by using a realtime analyzer (RTA) and pink noise.

An RTA is a device that measures the amount of energy present within various frequency bands. Pink noise is a test signal that has equal power in each octave. In order to test the frequency response of your system, you can play a pink noise source (discussed below) through your monitoring system. With the RTA's microphone set up at the "sweet spot" of the mixing position, the RTA can indicate the measured frequency response of the system (which should optimally be close to flat). This information can then be used to adjust an equalizer to compensate for peaks and dips in the system's measured response.

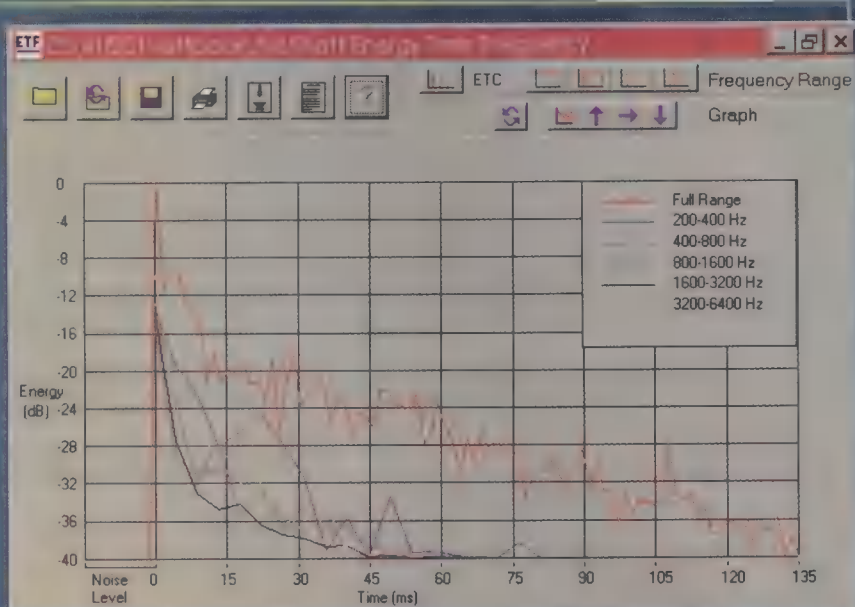


Fig. 4. ETF's energy/time display lets you see the level of your room's early reflections and the diffusion of later reflections at various frequencies.

Most high-end pro audio dealers rent out RTAs and pink noise generators. Make sure that you use a $\frac{1}{2}$ -octave analyzer so that you're working with somewhat specific frequencies. Using a $\frac{1}{2}$ -octave equalizer will make it easier to compensate in accordance with your measurements from the RTA. Both the Alesis MEQ 230 and the Samson E62 stereo $\frac{1}{2}$ -octave equalizers are suitable for this purpose. The "Smaart, Spectra Plus & Mac SLM" sidebar (page 64) describes equalization software that can be a big help in fine-tuning your system.

I mentioned fixing acoustical problems before equalizing the system because this is the order in which these problems should be solved. Acoustical solutions are far more effective and honest than equalizing. Equalizers often introduce undesirable phase shifts into the audio. However, they are often easier and less expensive to work with than structural acoustics, so if equalizing is your only option, it's much better than doing nothing and putting up with crummy sound. Just make sure not to get carried away—a little boost or cut here and there should be enough to smooth out the response.



Fig. 2 ETF's low-frequency display allows you to pinpoint any detrimental resonances in your room.

VOLUME

Since our ears perceive frequencies differently at different volume levels (hence the "loudness" button on home stereos, which is designed to compensate for our reduced sensitivity to low frequencies as volume decreases), it is very

important that you learn to mix at consistent levels. This is a big part of knowing what things should sound like through your system at a given volume. You might want to pick up a sound-level meter at Radio Shack for \$35 so you can measure the volume at which you're mixing.

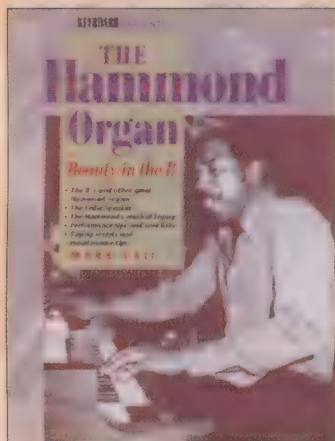
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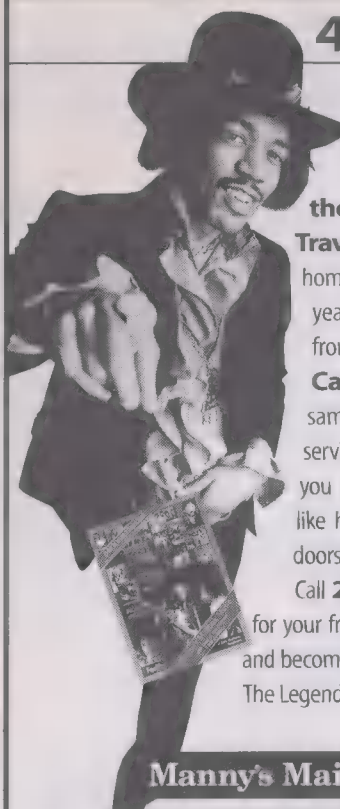
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STUDIO SPEAKERS

The film industry recommends mixing at 85dB (C-weighted), but I find that to be a little loud for my tastes. I'm usually satisfied with mixing at around 80dB(C). Just make sure to find a volume that you're comfortable with and stick with it. Many engineers recommend doing the majority of your mixing at a very low level, with occasional "reality checks" at louder levels.

CONCLUSION

Well, there you have it, monitoring from start to finish. In many instances, the guidelines I have presented may differ from your situation. That's okay. Just try to stick with the basic principles and you'll be on the right track. Remember that your monitoring system should have the flattest, widest frequency range possible. Also, the speakers and monitoring environment should be set up as symmetrically as possible so that the left and right speakers relate well to each other. And always give acoustical solutions a try before equalization when you're troubleshooting. These principles will put you on your way to

a fantastic monitoring environment.

Don't fall into thinking that you'll create a perfect monitoring environment on the first try. To the contrary, this is a process that may never end, but you'll certainly be pleased with the improvements that you make at every step. Make sure to try out a variety of new things, listen for the differences in sound, and try to pick up some

tools along the way to help you objectively measure and quantify your improvements. And may all your mixes be great ones.

Recording engineer and acoustical consultant Geoff Gocher owns Acoustical Research Associates, based in Southern California. You can reach him at rypgeoff@aol.com.

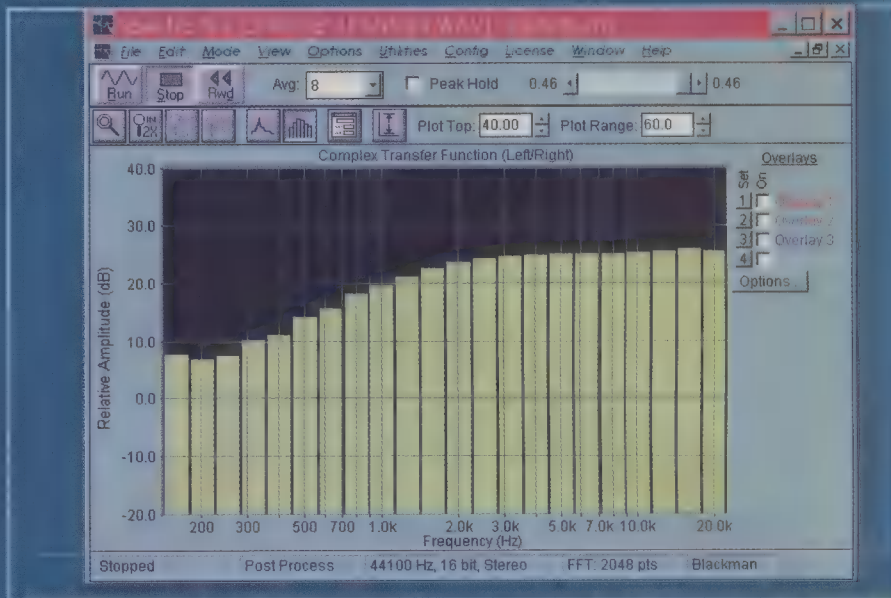


Fig. 1. Spectra Plus's transfer function window. 1/3-octave frequency response is shown.

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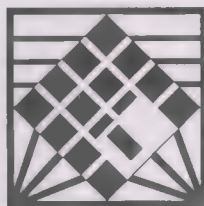
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Mysteries of MIDI

By Jim Aikin

Setting Up a MIDI System (Part 1)

For a couple of years now (has it been that long?), this column has been exploring how MIDI works at the level of the actual messages that fly back and forth in a MIDI music system. That's all well and good if your computer is already hooked up to a synthesizer or two and you're trying to troubleshoot a problem, or if you simply want to get better music out of your existing equipment. But before you reach that exalted plateau, you'll need to put together a functioning MIDI system in the first place.

When we say "MIDI music system," what are we talking about? As a first approximation, we might say you'll need a computer, some music software (most likely a sequencer), and some sort of MIDI keyboard. But you can also use MIDI to connect two electronic music devices — or two dozen — and never get near a computer. In that case, you're not likely to be reading *Music & Computers*, but with the right equipment, you could still get much the same musical results.

On the flip side, you could use a computer that's equipped with a soundcard, add some software that lets you record and play back music with the mouse and/or the QWERTY keyboard, and never hook up an external MIDI keyboard at all. You're likely to find that the experience doesn't stay fun for long, but if your interest is confined to poking around a bit in the world of computerized music, this is a convenient, inexpensive way to go.

For that matter, you could use a computer and music software in conjunction with a MIDI guitar or percussion controller, which would replace the keyboard in our first approximation. The system based on a computer and one or more MIDI keyboards is the most common, but even within this category there are a lot of options. This month we'll look at several of them; in the next issue (Nov/Dec), we'll get a bit more technical as we discuss how to hook the various pieces of gear to your computer.

The Keyboard. MIDI was originally conceived as a communications protocol for linking keyboard-based synthesizers. It's frankly keyboard-centric, and doesn't do a good job at communicating the performance gestures commonly used in playing some other types of instruments. But that's a subject for another time. [Ed. Note: See "Alternate Controllers" in the Mar/Apr '96 M&C.] Fortunately, the piano keyboard is among the most widely used musical instruments, so the MIDI keyboard provides a familiar input device for a computer-based music system.

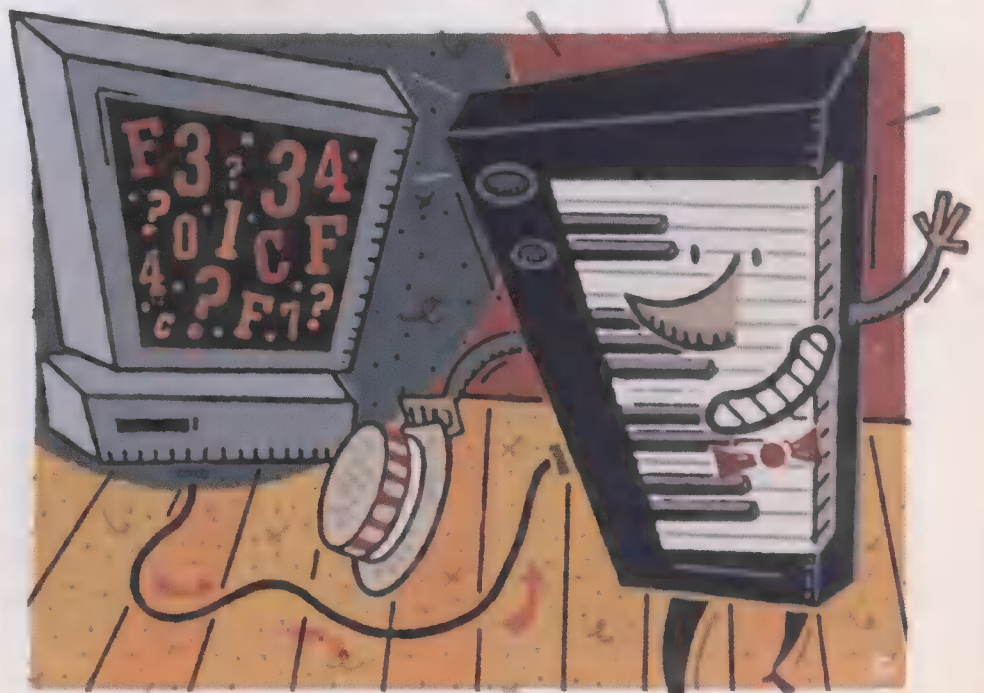
MIDI keyboards come in two basic flavors: Some make sounds, and some don't. In the former category are synthesizers, samplers, electronic pianos, and so on. The latter category consists of MIDI master keyboards, also known as MIDI keyboard controllers.

You might wonder why anybody would want a musical device that doesn't make any sound. Let's back up a step: It's

important to remember that MIDI itself is not sound; it's a type of digital communication signal. When you play a MIDI keyboard — either a synthesizer/sampler/etc. or a master keyboard — it transmits MIDI data through its MIDI Out jack. When this data is received by another device that can make sounds (such as a soundcard or synthesizer module), the data will be translated into something more or less musical. Plug the soundcard or module into a home stereo or other audio system, and you can enjoy listening.

So when a MIDI synthesizer is the primary peripheral in a computer MIDI system, it's actually performing two separate and distinct tasks. First, it's transmitting MIDI data from its keyboard to the computer. Second, it's making sound.

This is an important distinction. If you use the synth by itself, the keyboard's MIDI output will normally be sent directly to its internal sound generator, so you'll hear music. But either task can be performed



without the other. When the computer transmits MIDI data to the synthesizer, for instance, you'll hear the tone generator even though you're not touching the keyboard.

To unlink a synthesizer's keyboard from its internal tone generator, you use an option called Local Off (see Figure 1). This option is found on almost all synthesizers; look for it in the Global, System, or Utility area. When Local Off is selected, you can play the keyboard and transmit MIDI, but you won't hear anything from the synth itself. However, any other instrument receiving the MIDI data will respond normally, and when the MIDI data is received by the computer, it can be recorded by sequencer software.

If your system consists of a computer with sequencing software and a multitimbral synthesizer (one that can play multiple sounds simultaneously), you'll almost always set the synth to Local Off and use the software's MIDI Thru option. If you forget to switch the synth to Local Off, you'll hear a subtle but annoying problem: note doubling. Each time you press a key, the synth will play the note twice — first when the MIDI message travels from the keyboard to the tone generator, and then again when the same MIDI message returns from the computer. The doubling takes place so quickly that you won't hear two notes. However, you'll only be able to play half as many simultaneous notes as before. In addition, each note will have an odd phase-shifted quality. The doubling will occur only when you play the keyboard, not when the sequencer plays back a recorded track.

A MIDI master keyboard is equivalent to a synthesizer with no tone generator. It transmits MIDI, but you'll need another piece of hardware in order to hear what you're playing. If you're on a budget, a master keyboard is not a necessity: You may be better off purchasing a synthesizer and getting both the MIDI and tone generator features in one box. However, master keyboards typically have some advanced MIDI features not found on a standard synthesizer, so they can be useful in a larger system. At the other end of the cost spectrum, if your computer has a soundcard with an onboard MIDI synth chip, an inexpensive master keyboard (they start at around \$100) will let you play the soundcard much

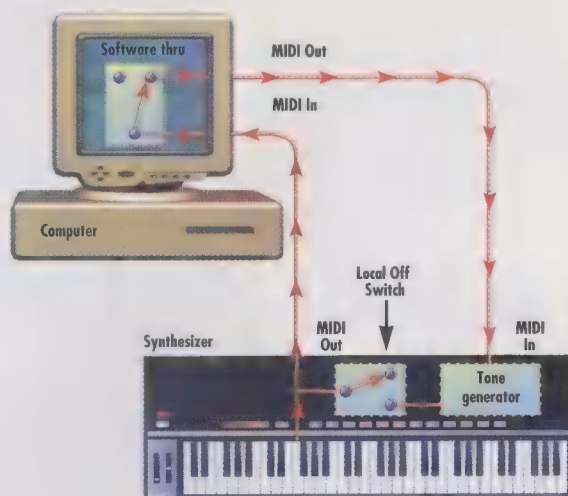


Fig. 1. Many sequencer programs offer a software MIDI Thru option, which redirects the MIDI data you play into the computer to the computer's MIDI output. (Most sequencers can also assign the data to a new MIDI channel, letting you play any of the "parts" in a multitimbral synth without changing your keyboard's transmit channel.) However, since the keyboard is also triggering its own sounds, you'll hear unwanted note doubling as the notes loop through the computer back to the keyboard's MIDI input. For this reason, you should switch your keyboard to Local Off when recording. This disconnects the keyboard from its internal tone generator. (The data moves so quickly that no audible delay is created.)

more musically than you could while confined to the QWERTY keyboard.

Other Bells & Whistles. As your MIDI system grows larger, it may come to include several types of components. Many of these can be controlled from the computer using MIDI messages.

- **Effects processors.** These are essential in today's music production process. By patching the audio output from a mixer channel, tape track, or drum machine to the effects processor's audio input, you can add reverb, chorusing, and many other types of effects to your music. Typically a dedicated effects box will sound better and be more versatile than the onboard effects in a soundcard. Some effects processors let you change effect parameters during song playback using MIDI Control Change messages. For example, you could increase the reverb time or change the wet/dry mix on the fourth beat of every other bar, so that one snare drum hit has a more cavernous sound than the others.

- **A sampler.** With a sampler, you can sample (digitally record) sound effects, drumbeats, and spoken or sung phrases and trigger them from your MIDI sequencer. A sampler with plenty of RAM can be especially handy if your audio recording hardware has a minimal number of tracks (or if you don't have any audio multitracking capability at all): A few judiciously applied samples will make your

music sound much more professionally produced. With Control Change messages, you can make many of the same kinds of changes in a sampler's sound that you'd make in a synthesizer's — changing the filter cutoff frequency, for instance, to make the sound brighter or more muted.

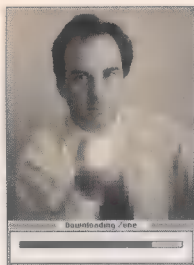
- **A MIDI slider box.** I'm a big fan of the Peavey PC-1600, an inexpensive yet powerful peripheral for the larger studio. It's not the only MIDI hardware accessory that offers programmable sliders and buttons, but it's the best one I've seen. Its 16 long-throw sliders can be programmed to transmit just about any type of MIDI message you might need, including System-Exclusive. You could create one preset that transmits volume controller messages on all 16 channels, for instance, giving you a pseudo-mixer with which to record fade-ins and fade-outs on many tracks at once.

And all of the output from a slider box can be recorded into your sequencer.

- **Other MIDI software.** I've been assuming that your MIDI system will include sequencer software. Other types of programs you might want to incorporate at some point include auto-accompaniment (such as PG Music Band-in-a-Box and Soundtrek Jammer), an editor/librarian for archiving your synthesizer sounds (such as Opcode Galaxy and Mark of the Unicorn Unisyn), algorithmic composition software (such as Opcode Max), and even a simple MIDI data analyzer (such as the shareware Kurzweil Midiscope). If you're not familiar with these types of programs, you're in the right magazine but on the wrong page. Keep reading *Music & Computers* and you'll be an expert before you know it.

There's one peripheral, however, that isn't in the "bells and whistles" category: It isn't optional, it's essential. That's a computer-to-MIDI interface. Without this piece of hardware, your computer can't speak the MIDI language at all. But we're out of space, so we'll tackle MIDI interfaces next time. ◀

Jim Aikin is the senior editor of Keyboard magazine. His adventures with MIDI in his home studio began on the week in early 1983 when Sequential Circuits shipped two Prophet-600s and a MIDI cable to Keyboard for review.



Downloading Zone

By John Poultney

Scare Your Pets

I'm all excited over here. Why? Because I just downloaded myself a software-based Theremin for Windows 3.1/95. Now just by moving my mouse around, I can make those crazy *weeeeeoooo* sounds from '50s movies, back when space-age was really space-age. (See *The Day the Earth Stood Still* or listen to the Beach Boys' "Good Vibrations" if you don't know the sound I mean.)

Being a quirky fellow, I've been an aficionado of the Theremin for some time. Perhaps a little history lesson is in order, though. Back in the early 1900s, a brilliant Russian scientist named Lev Sergeivitch Termen came up with the idea to make music from thin air. His invention produced sounds when performers waved their hands near two metal antennas; one controlled pitch and the other volume. (See Figure 1.) By the 1930s, the instrument became fairly well-known, and through the magic of marketing and the quest for snappy names, his invention became known as the Theremin. (Although, in my opinion, Lev Sergeivitch Termen is a fairly snappy name.)

The device was one of the world's first electronic musical instruments. Unlike keyboard-based instruments, its range wasn't limited to discrete pitch steps; in skilled hands it could be made to sound much like a human voice, but with an ethereal attack that defied easy categorization. The Theremin's expressive quality lent itself well to certain types of classical music, particularly in the hands of one Clara Rockmore (see www.geocities.com/Vienna/1859/index.html), but its otherworldly sounds found a more receptive audience among producers of science fiction films of the '50s and '60s.

Since then, a few daring composers (such as the Beach Boys' Brian Wilson and Alabama's premiere space-surf-punkers

Man . . . Or Astroman?) have worked the Theremin into pop music, but its legacy remains mostly as a sound-effects device.

There's been a Theremin resurgence of late, due in part to Steven Martin's masterful documentary *Theremin: An Electronic Odyssey* (see www.iquest.net/theremin/), and there are a few newfangled solid-state ones available (as well as some kits, notably the Big Briar instruments developed by synthesizer pioneer Bob Moog), but you probably won't find a Theremin in your local music store.

Start Whimpering.

An interesting side effect of Theremins is that they can scare pets somethin'

"We hope this program will encourage musicians to think of using their computers as a musical instrument," he said, as I was busy evaluating the effect of MouSing on cats.

fierce. Not that I advocate any *real* cruelty, mind you, but should you fire up a Theremin with ol' Rex present, don't be surprised if the old fella cocks his head quizzically, starts whimpering, runs around in panicked circles, and claws desperately at the door to *get out*.

Whether or not the good people of Sagebrush Systems understand this, they have artfully constructed a Theremin-like object in software and made it available for \$15 at www.sagebrush.com/~sells/index.htm. The program is called *MouSing*, and it's mighty cool. (See Figure 2.) Regular readers of this space know well my propensity to space out, and I've gotta tell you — a guy could go plumb loco playing with this program.

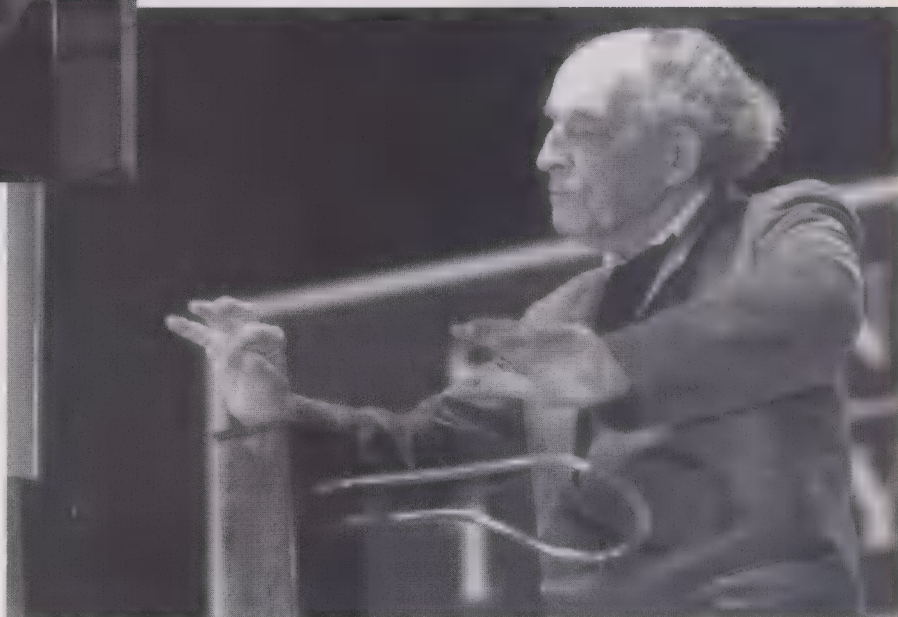


Fig. 1. Inset: Charles D. Stein, an early electronic music enthusiast, plays the Theremin at the Texas Centennial Exposition in Dallas in June 1936. Above: Termen himself performs in 1991.

Assuming you have a 486/33 (or better) equipped with a soundcard, all you need to do is move the mouse around your desktop and you'll hear the dulcet tones of a Theremin right from your computer speakers. Move the mouse from left to right and the pitch goes up; move it away from you and the volume goes up. Simple, classic, beautiful.

Jim Sells of Sagebrush says MouSing works by sensing the cursor's position and determining therefrom the volume and frequency of a sinusoid waveform, which is calculated in real time and sent to the computer's audio outputs. "We hope this program will help encourage musicians to think of using their computers as a musical instrument," he said in a recent e-mail as I was busy evaluating the effect of MouSing on cats. (As expected, they're curious at first, maybe scared just a little, but ultimately not impressed.)

I think Jim may be right. He also mentioned using other types of input devices besides a standard mouse, such as a graphics tablet, gyro mouse, or virtual reality glove. The mind reels.

MouSing is very simple to use. You get "Play" and "Stop" buttons; press Play and the program is activated. There are slider controls for overall volume and tremolo (a periodic change in volume), as well as for the active pitch range. You can set it so the entire travel of the mouse from left to right varies the pitch from 20Hz to 1kHz, or from 20Hz to just over 10kHz, or various ranges in between. You can also choose 8- or 16-bit output resolution, 22- or 44kHz sample playback rate, and even mono or stereo. (Use the less taxing settings if you have a slower machine.)

Jim tells me the program in its current state (June '97) is best suited for sound effects, rather than for melody playing, because it falls prey to "the dreaded Windows .WAV output device latency problem." That is to say there's a noticeable delay between the time you move the mouse and the time you hear the pitch change. Not much, but it's definitely there. Try to move it too fast and the sound may cut in and out. Jim notes, however, that Sagebrush hopes to take advantage of a new Microsoft game-sound technology called DirectSound, which promises to reduce the delay significantly.

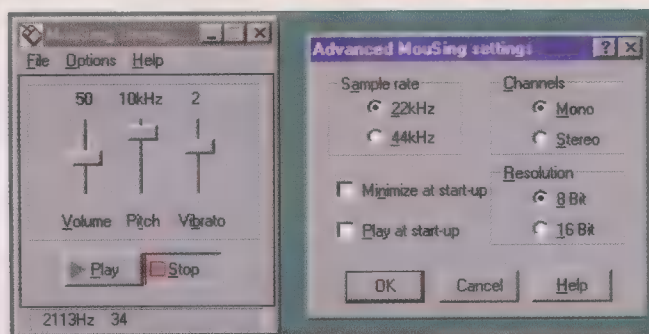


Fig. 2. The Theremin now, sort of: Sagebrush Systems' MouSing changes the pitch and volume of a sine wave as you move the mouse. The number at the bottom left shows the current frequency (pitch); the smaller number to the right indicates volume.

Also on the drawing board are MIDI support (the concept of which reminds me a little of Laurie Spiegel's Music Mouse, reviewed in the July/Aug '97 M&C), other effects, and maybe even direct-to-disk recording.

Get out there and download this one with all speed, friend. (To paraphrase Kiss, for my money, it can't be too soon.) Sagebrush also has several other inventive apps available, including a windchime program that makes soothing noises in the background as you work, and a "Clapper"-like utility that lets you turn on household appliances using your soundcard and a microphone. In case you're among the unlucky unWebbed, send a check to Sagebrush Systems, P.O. Box 3094, Corrales, NM 87048.

Sorry, Mac fans — Sagebrush says there are no current plans for a Mac version. However, there's a somewhat cheesy but nonetheless interesting online Theremin at www.users.interport.net/~aqu/thereminindex.html; this site uses Macromedia's Shockwave streaming audio technology (see the Jan/Feb '97 M&C) to intriguing effect.

Shakin' Like Tremolo. A recent foray to www.buena.com yielded yet another




Fig. 3. Buena Software's misspelled but cool Stomp Box Tremelo and Delay programs turn your Mac into a realtime effects processor. Use 'em in rackmount or footpedal mode, but don't stomp too hard.

device — this one for the Mac — to make pets tilt their ears unevenly. There are two cool programs here, actually, Stomp Box Tremelo [sic] and Stomp Box Delay, and they turn your Mac into a realtime effects unit. (See Figure 3.) While the quality isn't quite as crystal clear as a Lexicon rackmount, these little \$10 shareware gems will put a smile on the face of even the most jaded Merciful Fate fan.

With Stomp Box Tremelo, any sound input source, including CD, microphone, guitar, or what-have-you, gets that shakin' tremolo sound. You get two volume controls and a timing knob; you set the volumes to two separate levels to determine the amount of tremolo. The timing control determines the length between the two peaks. Simple? You betcha. But that's kind of nice in these days of huge, complicated music apps. There's a setting to use the program with a sequencer, but author Darrin Cardini says that just frees up some processor time so that sequencer timing won't be compromised by the tremolo effect.

The controls for Stomp Box Delay are similarly simple; either program can be displayed as a rackmount or a foot pedal. You get greater control of the parameters in rackmount mode, because it has actual digital readouts for each knob. For example, you can adjust the "Time" control on Stomp Box Tremelo from 20 to 999 milliseconds. In footpedal mode, you just have to guess.

Darrin told me he has always liked effects-laden music, and in particular was inspired by a song by 808 State when writing the Stomp Box applications. He also admits to having owned a few pedal effects; I like that in a musician. I used to have all sorts of strange little white, orange, and blue boxes lying all over the house, and was constantly running down to Rexall to buy new batteries. Call me a dork, but to me it's mildly thrilling to see these things reconstructed in software.

Still, I wouldn't put a PowerBook 3400 on stage and stomp on it. 

John Poultney is a staff writer at MacWeek and plays bass with the Human Torches (www.actionpacked.com). Known aliases include 74131.3235@compuserve.com and jpoult7734@aol.com.



Necros, Basehead, & Skaven

In the shadowy underground world of MOD files, there are many people making music, although most of them create their art in obscurity.

Then there are those musicians whose handles crop up over and over — those who are universally (it seems) regarded as standouts in talent and technical ability. Their names show up in polls, on Web pages, in Usenet postings, in #trax on IRC, and in e-mail to this column asking, "Why haven't you covered so-and-so?"

As luck would have it, a number of those top trackers have joined together in a group called the Five Musicians, or fm, and three of them have submitted songs.

Necros-File. "Mechanism 8," a 750KB S3M-format file by famed tracker **Necros**, uses a strong if repetitive rock/dance beat as its foundation. There's a very simple chord progression underlying the first half and the last part of the song, and an interesting break in the middle. Dance tunes are often repetitive, if not trancelike, and it takes skill to put enough variety into them that the listener won't become bored with the groove (particularly if you're only using a few chords). Fortunately, Necros has some tricks up his sleeve.

One of the things I really like about "Mechanism 8" is the samples themselves and the way they fit together like parts of a puzzle. There are a number of resonant, raspy, metallic samples that carry the main melodic and rhythmic interest. These are underpinned by pads (sustaining sounds) and orchestra hits that add to the mix without throwing it off balance. The drum samples are strong and meaty, and the bass is a simple tone, the perfect complement to the ring-modulated-sounding midrange samples.

In the middle of "Mech 8" is a very cool drum solo. Careful use of velocity changes in the individual drum notes adds realism and keeps the solo happening.

The tune works not because of any virtuosic melodic soloing or grabby, hooky lead lines, but because of the overall

cohesiveness of the sounds themselves. The mechanical images evoked at the beginning of the tune are developed and kept interesting by virtue of the sonic palette and delicate mixing.

Necros (Andrew Sega) has been tracking since '93 and holds down a genuine day job. He must have talent on his side as well.

The Cat Came Back. "Revenge of the Cats" is the first song in a while by **Skaven** (Peter Hajba). In his own words, it's "sort of a comeback. After a year of rusting up, I squeezed together nearly five minutes of hyperactive junk."

"Cats" (in .IT format) is an excellent, rollicking, hard-edged, cat-clawed, prog-rock instrumental piece. Like a prowling feline, you never know where it's going to pounce next — a flying guitar solo here,

a slinking funky drum break there. That's what's really fun about this upbeat piece: all the changes in feel.

Another thing that makes this piece rock is the judicious use of different sounds (both instrumental and other "found" samples). There are soaring lead guitar sounds at the beginning and end, with arpeggiated riffs in the

background throughout, but there are also various breaks where swirling organs pound out a furious funk syncopation. Additionally, groaning humans squawk in twelve-tone desperation. Those cats can shred!

Although all the changes in feel are refreshing, I would have liked more structure in the song. This is one of the downfalls of tracking in general — not

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enough thought is given to the song's structure. Trackers are confusing variation with composition. It's too easy to take some patterns you've created and simply re-arrange them further down in the song in different orders, or to take a pattern and remove some of the instruments to strip it down and use that for a "break." (This seems to be a compositional rule in techno.)

Surprises. The next entry, "Search for the Lost Riff," was cowritten by **Basehead** and **Necros**. Basehead submitted it after contacting me on #trax. I'm glad he did — I've heard this song before and like it.

"Search" is a nearly perfect composition. How can I say that? Let's call this a pop tune. It's the kind of thing you could imagine a radio or TV show adopting as its theme. It stays true to its feel and expresses it in a way that is cohesive but full of surprises and pleasures. It has a logical and complete structure with breaks and choruses that hit just when you feel they should. A changing series of instruments handles the melody in a way that keeps things interesting. "Lost Riff" also has a strong melodic and harmonic sense.

Another cool thing about this piece is the progression in the feel of the solo parts. The initial solos are played with a fairly straight synth patch. As the song proceeds, more effects are added — echoes, vibrato, etc. These changes give a sense of direction and movement from one place to another.

Here's another example of what makes this song great — there's a one-bar drum intro, then eight bars of drum and bass riff. Some Bruce Hornsby-inspired piano parts are brought in to play the chordal signature of the piece for eight bars, then repeated with variation for eight bars. Now you feel the melody is about to begin. So Basehead and Necros stick in an extra bar of drum break! Make sure you check it out on the MOD Philes Web site.

I also like that this tune has a distinct and planned ending. Listen to how they looped the cymbal sample to make it sound like a mallet swell. It's a bit rough because the looping is obvious, but it's a nice touch anyway.

You can visit the Five Musicians at www.fm.org.

Pulse Pulls Impulse Tracker. It's wonderful how many sophisticated tracking tools have been made freely available. Jeffrey "Pulse" Lim's Impulse Tracker has won favor because of its expansive capabilities and familiar interface. The program has been free, but for the upgrade that writes pro-quality stereo .WAV files, Pulse asked for \$30. Thirty crummy dollars. That's all.

He was often greeted with obscene responses and his hard work was freely pirated. As a result, Jeffrey will no longer make new releases of Impulse Tracker available for free.

In his words, "Impulse Tracker is my work of art. I wanted it to be something I could share with everyone who would find joy in using it. And so Impulse Tracker was released as a program that you could use freely. It wasn't a program that just 'appeared.' I slaved at it for hundreds of hours . . . easily over 1,500 hours, probably closer to 2,000. To those of you who have contributed, I thank you. You will receive updates as I make them. To all the others, IT 213 will be the final public release you'll see from me."

Sounds like some trackers have killed the goose that laid the golden digital egg. Pulse, I would like to appeal to you to continue to make future versions of Impulse Tracker available to the public. The tracking scene thrives on free exchange of music and free or inexpensive tools. There are a lot of true artists whom you may not have heard from who rely on your work. These are the people who deserve your attention, not the nasties who steal from you and abuse you in ASCII.

Conversely, people, if you use the .WAV writer, pay for it — your music is obviously important enough to you to dump to CD or other format. Reward Pulse for his hard work, too.

Eric Bell is the top dog at Howling Dog Systems, makers of Power Chords. He wonders why the "different color for each note" notation system used in children's xylophone music never caught on.

Trackers are confusing variation with composition.

MOD Philes Online

You can reach the MOD Philes Web site and have your say in our new Usenet newsgroup by visiting:

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There you'll find the tunes we write about, tools to play and compose MODs, other readers' feedback, and lots more.

To submit your original MOD tunes, just log on and follow the instructions. If your composition is selected for coverage in this column, you'll receive one of a number of fine prizes. These include **Midiman's MultiMixer 6** mixer (visit them at www.midifarm.com/midiman), **Sonic Foundry's Sound Forge XP** audio editing software for Windows (see www.sfoundry.com), and **Schatztruhe's MODs Anthology** CD-ROM of 18,000 MOD files (see www.schatztruhe.de or www.ninemoons.com). ◀

MOD Philes Bit Bucket

Now there's a cool browser plug-in that will play MODs right off the Web: Olivier Lapique's MOD-Plug (www.castlex.com/modplug). There are versions for both Netscape and Internet Explorer. Olivier has developed a technique for packing MODs to about half their normal size, reducing download sizes. He has also developed a stand-alone player and is working on a tracker for Windows.

Also be sure to check out Kim's MOD Page at www.castlex.com/mods. It's very interactive with lots of graphics, online MOD music, chat, etc. ◀





How Do I . . .

By Scott Garrigus

To hear an audio tour of the making of the music discussed here, visit www.music-and-computers.com.

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How Do I Use MIDI and Digital Audio Together?

It was a spectacular spring day, but as usual I was stuck inside weaving some monthly magic into my Web site. While adding a few new links to the home page, I had a brief thought about creating an online audio tour. As I went to jot the idea on a nearby sticky note, there was a knock at the door. It was the UPS person with a package from the good folks at Cakewalk. My advance copy of Cakewalk Pro Audio 6.0 had arrived!

Ah, the joys of new software. I immediately ripped open the package and was soon jamming along with some very cool drum, bass, and keyboard tracks. The online audio tour project just got top priority. But there was something missing — guitar. Since MIDI can't provide very convincing guitar tracks, it was time to do some digital audio.

Tempo & Time Stretching. I called a friend over (let's call him Jim) to lay down some tracks for me. Unfortunately, being only good — not great — at playing guitar, Jim wasn't able to keep up with the MIDI band. To remedy this, I temporarily lowered the song's tempo to a more manageable rate and we were able to get some pretty nice takes recorded . . . or so we thought.

When it came time to bring the tempo back up, the MIDI tracks played fine, but the guitar sounded like some sort of string thing from outer space. Cakewalk had automatically time-stretched the audio tracks so that they would stay in sync with the MIDI data. But since the tempo change was so drastic, Cakewalk wasn't able to speed up the audio without adding some unwanted artifacts. (The same thing would have happened

with any other late-'90s audio-processing tool. Stretching or compressing audio always affects the sound quality. Unless you're going for a special effect, you should limit the time-stretch range to $\pm 10\%$ — even less for really sensitive material.) So, it was back to the drawing board. . . .

Break It Up. This time I played it safe and only brought the tempo down slightly. Although Jim was still unable to keep up through the whole tune, he could play for small stints at a time. So instead of recording one long track, we broke his performance down

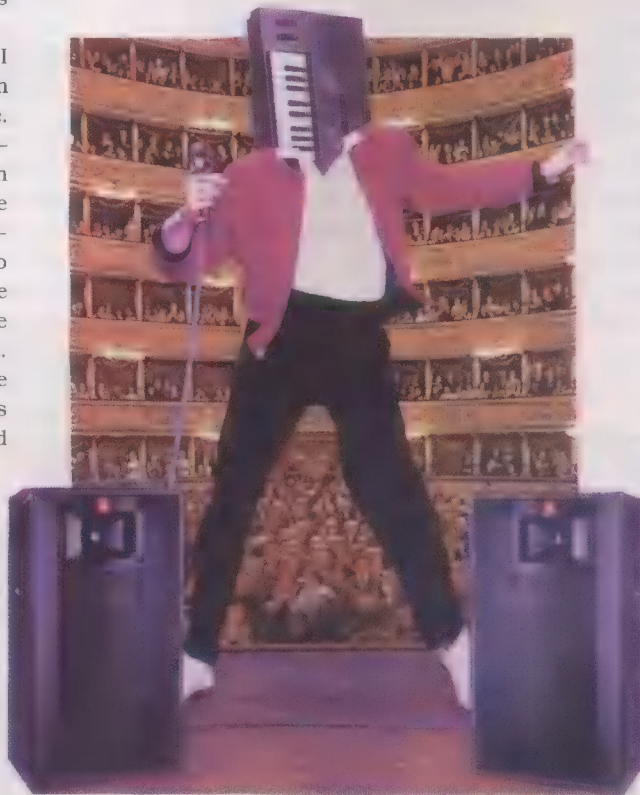
Since MIDI can't provide very convincing guitar tracks, it was time to do some digital audio.

into short riffs. Each riff was recorded as a separate audio clip on the guitar track. I did this by placing markers at different locations in the song where I wanted the guitar to come in. Then I set the song position (or "Now Time," as Cakewalk calls it) so that playback would start right before the section we were recording. This gave Jim a bit of a

lead-in before he had to start playing.

We recorded each section this way. Not only did this get us a good guitar track, it also helped in three other important ways. One is that short clips of audio take up less hard disk space than one long recorded track. Unlike MIDI data, digital audio data is recorded whether an instrument is being played or not. Digital audio silence equals wasted space. Second, when I brought the tempo back up this time, the time-stretching worked great, not only because I used a smaller range, but because Cakewalk seems to process short clips of audio more accurately. And finally, editing digital audio a piece at a time is not only faster but easier as well.

Post Process. Now that I had all the tracks down and playing as they should, it was time to do a little tweaking. First, I selected each audio clip one at a time and transferred it to a separate audio-editing program called Steinberg WaveLab. [Ed. Note: Scott plans to review WaveLab for our Nov/Dec issue.] Although Cakewalk contains a wide variety of audio processing functions, it isn't a dedicated audio editor,



so, like most other digital audio sequencers, it includes the ability to export audio. I used WaveLab to make sure that each of my audio clips was free of DC offset. This occurs when there is a direct-current component in the signal, which is often caused by level mismatches between recording equipment; the waveform will no longer be centered around zero (see Figure 1). DC offset can create noise when you're editing and processing audio. A small amount won't do anything significant, but hey, I'm a perfectionist.

While I had each of the clips open in WaveLab, I also *normalized* them, increasing the level of the whole file until the loudest part was at the maximum allowable value. This ensured that the audio would play back at its full level without clipping. You have to be careful with this function, though, because not only does it raise the level of the source material, it boosts any background noise as well. Luckily, we cut some pretty clean tracks, so noise wasn't a problem. Of course, now the guitar was a bit loud in the mix, so I had to adjust the volume levels of the MIDI tracks, but that was as easy as changing a single setting.

Effects . . . ect . . . ect. As I listened to my soon-to-be-finished masterpiece, I decided I needed to spice things up a bit. I wanted to have a key change in one section of the tune to add some excitement. As usual, this was an easy task with the MIDI tracks. A simple transposition was all it took. To keep everything in tune, though, the audio had to be transposed as well.

Normally, when you change the pitch of an audio file, the length is altered too. Raise the pitch and the file gets shorter, lower the pitch and the file gets longer. When this happens, the audio no longer plays in sync with the MIDI. Luckily, most of today's audio editors have pitch-shift effects that allow you

to change pitch without changing the length of an audio file. The only thing to be wary of is that as with time-stretching, pitch-shifting can produce unwanted artifacts if too large an interval is used. The now-famous Alvin & The Chipmunks are a product of this effect. It's best to stay within an interval of a

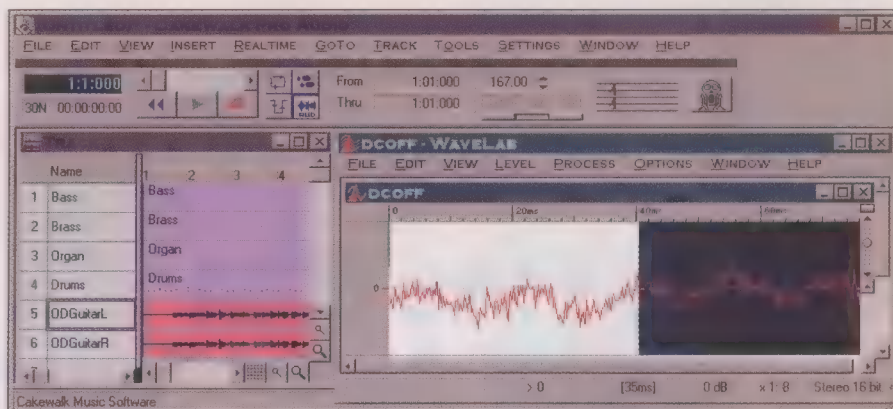


Fig. 1. In Cakewalk's track window (lower left), you can see the main difference between MIDI and digital audio. MIDI data (track 4) is recorded as discrete note events that can trigger sounds on a synthesizer, whereas audio (tracks 5 and 6) is recorded as a continuous waveform that can be played back by the digital-to-analog converters in a sound-card. The white section of the WaveLab window (bottom right) shows an audio file marred by DC offset — a constant voltage has been added to the signal, causing it to shift away from the zero-volt reference point. This results in increased noise. In the black section of the window, the offset has been removed.

major third (four semitones) if possible. For the guitar track I only needed to shift the pitch two semitones, and Cakewalk's Time/Pitch Stretch effect did a nice job.

I also wanted to add some distortion to dirty up the guitar parts a bit, and for this I used Sonic Foundry's Sound Forge audio editor. I launched Sound Forge from within Cakewalk just as I did earlier with WaveLab. Sound Forge has a great distortion effect that can simulate the overloading of an amplifier. It does wonders for guitar, and made this track scream quite nicely.

Lastly, a bit of reverb was in order since the guitar was way too dry for my taste. Normally this would mean combining all of the separate audio clips into one large clip, then exporting the file to another program such as Sound Forge or WaveLab, adding a reverb effect, and then importing it back into Cakewalk. Since Cakewalk now sports its own built-in reverb effect, though, adding reverb to my guitar track was as easy as selecting

the track (which in turn selected each audio clip within it)

and applying the effect I wanted. If two of the clips resided so close to one another that the tail of one clip's reverb was going to collide with the beginning of the next clip, Cakewalk automatically merged them. Very nice.

Final Mix. There was still one problem, though. I couldn't very well have reverb

on the guitar track and nothing on the MIDI tracks. From here I could go a couple of ways: I could try to match the guitar's reverb as closely as possible with my synthesizer's onboard reverb, and then mix down that way. Or (thanks to the undo function) I could first remove the reverb effect I had previously applied to the guitar track, then mix everything down to a final stereo digital audio file while applying one uniform reverb effect. To do this, I would have to send the digital audio tracks and the synth tracks through an external mixer and a reverb box, then record them back into Cakewalk as a new file. (Unfortunately, Cakewalk's realtime effects only work on pre-recorded audio tracks, not incoming audio.) I opted for the second solution, because even though having different reverb on different parts of a mix can be an interesting effect, to me the uniform approach sounds more "live."

After all was said and done, there was one final task to perform — using Sound Forge to convert my final mix into RealAudio format so that it could be easily listened to over the Internet. Of course, I could have left the MIDI and digital audio tracks as they were and used one of the new technologies like LiveUpdate's Crescendo that lets Web sites stream synchronized MIDI and audio, but that's a topic for another column. ▶

By the time you read this, Scott Garrigus should have the online audio tour up and running at www.village2000.com/comp.media/. If you have a chance, surf by and take a listen.


Unlike MIDI data, audio data is recorded whether an instrument is being played or not.

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A Pipe and a Beer. There's a very interesting line that draws itself in the sand: The kind of decisions that add personality, excitement, humor, power, mystery, dynamism, and love to music fall onto one side of that line. On the other side seem to land all the kinds of decisions that a computer could possibly make. A computer can't generate humor. Surprise, tension, a sense of expectation, teasing a person with that expectation, fulfilling that expectation . . . it can't happen, because the computer can't relate to the very emotional level at which any one note or small group of notes might hit us in any given context.

The delight in walking through an art gallery is to see, in a painting of an old man with his eyes twinkling and a pipe in his hand, drinking an obviously delicious cold glass of beer, this surprisingly wonderful commonality: "Wow. That's *exactly* how I feel about a pipe and beer." It's almost a shock, because no one could say that in words.

Music works the same way: "For some reason, this order of notes is tickling my fancy in a way that no textbook could describe. It has surprised me, I have fallen into its pattern, and yet around every


turn has been a different reordering of these notes that has drawn me deeper and then shocked me again."

It's a mystery how this long-dead composer or this Scandinavian pop star could know so much about how I'm going to hear those notes. How could they speak to me across these great oceans of time and water in a way that rings so true? There must be something going on. There's some commonality of thought, of heart, of soul, that goes beyond this world of words that attracts so much of our attention so much of the time.

This goes not just for the person who's listening to music, but for the person who's composing music. How was I able to do that? How was I able to simply write something that I like and have other people really like it? Why did that work? I'm going deeper into this next time. I'm going to try something that I don't know why I like it; it's just kinda neat. And you find that that works again, even better. So you go further in that direction, you get further away from the rules, and you get more and more into an area where a computer could never go. A computer could never say, "I

kinda like this. I think I'll try something that's even more that way," because it's missing the "kinda like."

That's almost all that we've got that a computer hasn't. The further you go in finding out where that line is, the more you can discover what it is about yourself that's not like a computer. What is it about you that's beyond what anything in the physical world could be? Where does the body end and the soul pick up? What is this thing about me that might just be immortal, because it's so much not like anything else in this world?

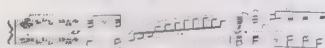
The computer can help us get into those areas, but only when it starts to be seen as not just a tool, but one that is eventually to be cast aside. 

The Fat Man, George Alistair Sanger, is internationally known as the biggest name in music for interactive entertainment. Together with Team Fat, his gang of cowboy composers, he has contributed the musical scores for over 100 software products. For more Fat thoughts and music, visit www.fatman.com.

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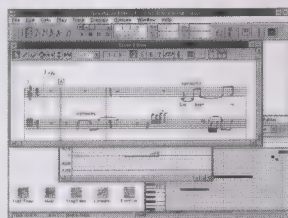
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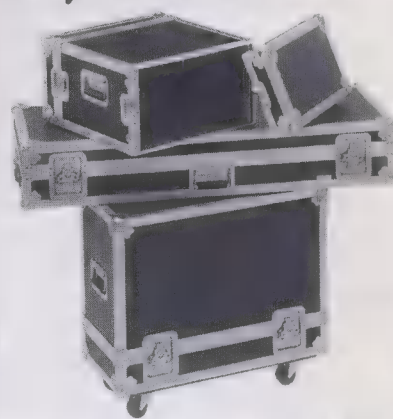
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Shake Your Buddha

Team Fat was recently graced by a visit from legendary game producer Brian Moriarty, and of course we took him out horseback riding. While we were out there, he was interviewing us for a radio-show segment on Mplayer, the multi-player gaming Web site. "You know, Brian," someone said, "you could get a little solar panel for your hat and bring your computer out here. You could attach a wireless modem, and dial in from the horse, and—"

Just then, the woman who was renting us the horses rode up and someone asked, "Gerry, you ever use your computer?" She replied, "Hmm. Now let me see. . . . Should I spend my time on a horse . . . or a computer? Duh!"

We suddenly realized that the whole idea of dressing somebody up in a beeper, a cellular phone, and a portable computer, then sending him out on a horse is at cross-purposes. It just ain't right. But it was so obvious to her that the point of being alive is to be out there riding your horse.

Symbol, Simon. There's a lot that we don't know about that's going on all around us — a deep, invisible layer of activity and interactions. Computers don't have much to do with that rich part of living, whereas music can be right at the core of it. But computers can be a tool to get at that invisible layer.

Art is all about pointing out whatever we can about that layer, usually in a nonverbal, symbolic way. That's also one of the jobs of religion, which is one of the reasons we see a lot of poetic, artistic, and symbolic work in religion. People create those things because they feel something deep inside that is mutual. According to writer Joseph Campbell, that feeling is like a dream that society as a whole is having, and it's the job of artists to draw attention to that.

Where do computers fit in? I don't know if I'd be able to compose any kind of complex piece without the help of a

computer. I'm just confusable and disorganized enough that I had to wait about ten years from the time I got my composition degree until I had access to a MIDI sequencer before I realized that I actually could compose. Now that I have that confidence, I find that I'm composing pieces on the computer and then moving them off the computer for jazz

combos to play. Once the flesh and blood gets back into it, it loses the taint of computerism, yet keeps all of the intricacy and complexity and organization that the computer brought to it. (And when it doesn't, it at least has the potential!)

Computers are great for sketching out orchestration ideas, and in a pinch, they can be used to produce the notes, too. But when they have their hand in that, they sometimes leave a cold spot where a warm spot could be. And when they have a hand in the composing, in presenting you with the notes you might

A computer could never say, "I kinda like this. I think I'll try something that's even more that way."

want to use, they again leave a vacuum where there might be the smell of some good home-baked bread.

How can you get around that? Well, given that our goal is to point at an invisible layer and maybe get a sense of where we fit in relation to that, there are a couple of ways you can go to avoid that clammy, computerized feeling. One is to not let the computer generate the tones. Take your MIDI part and rather than playing it back on a synth, get a sax player in there. If the computer is composing for you, then you can use that material as inspiration. Look inside and see what rings true, and use those choices to filter out what the computer is doing haphazardly.

The other side is, do you *need* to avoid it? One aspect of art is shock value. And once in a great while, the computer's artificialness and coldness can create that valuable flip-flopping sensation that art can have.

Continued on page 79



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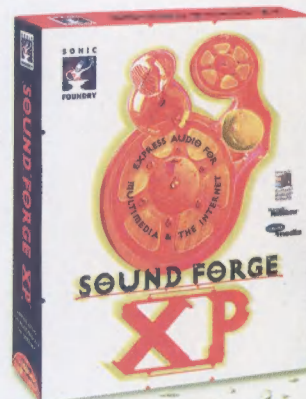
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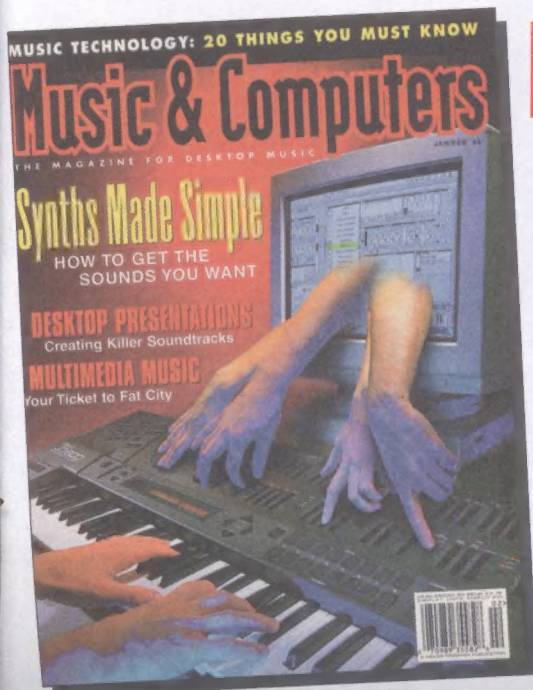
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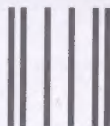
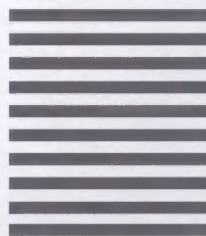
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